BEECH FORESTS

COVER: A fine mature stand of red beech reserved in the Maruia Valley, West Coast.

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BEECH FORESTS

by

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A.P. Thomson,
Director-General of Forests.

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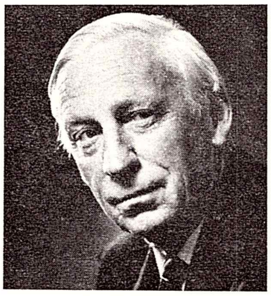
FOREWORD

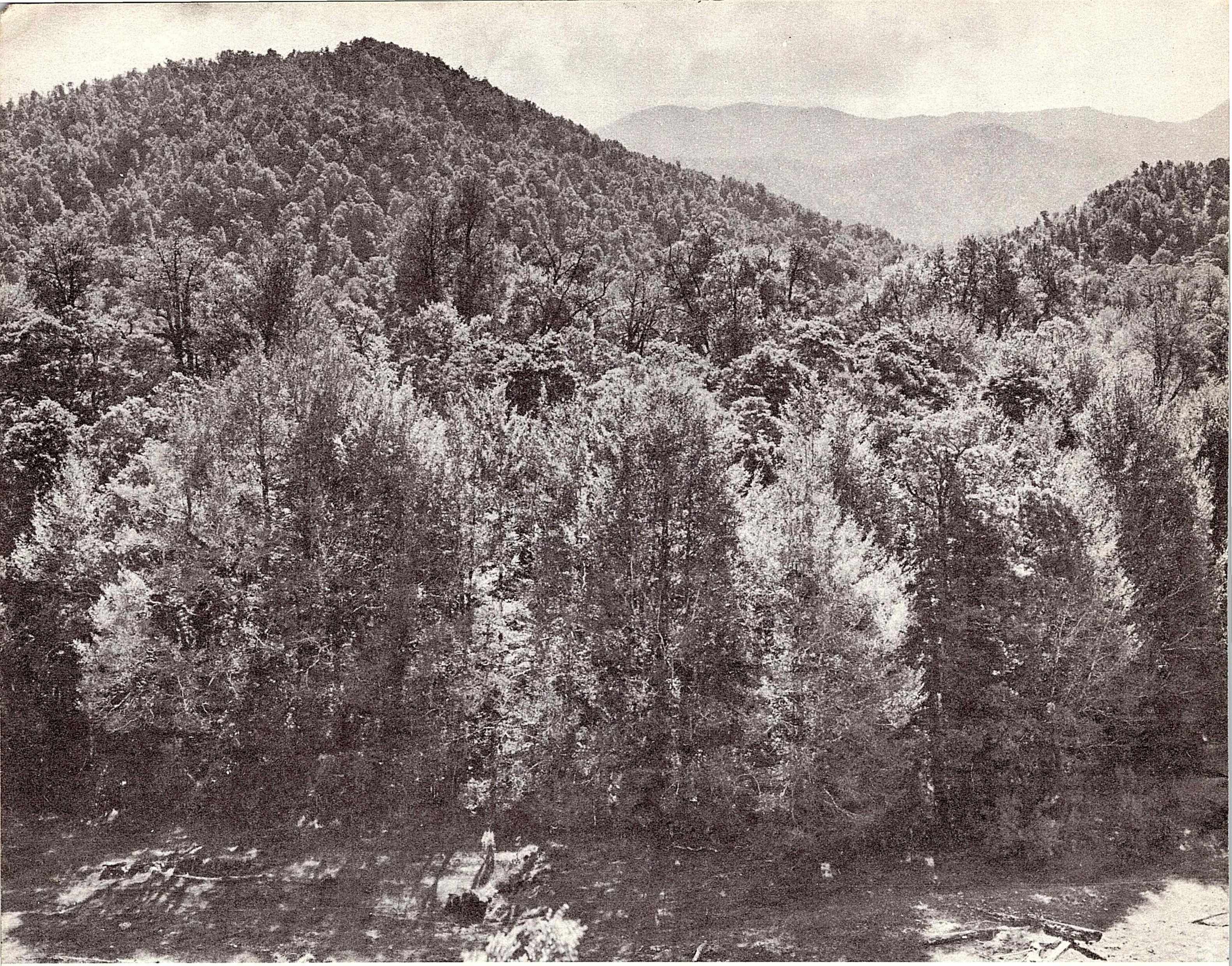


The potential for the fuller utilisation of South Island beech forests was first explained in the annual report of the Forest Service for the year ended 31 March 1970. Broad plans were subsequently made public in a report, often referred to as the White Paper, to the House of Representatives in October 1971. The purpose of this report was to allow public consideration of possible developments and of their forest-management and land-use implications so that representations might be made before any proposals were invited from industry. The resultant interest — an indication of the generally increased public concern with environmental matters — has been widespread. This interest is welcomed. However, it has become obvious that despite the publication of the White Paper in 1971 and the large volume of correspondence and discussion that has followed, the nature and intent of the proposals have not been well understood by many people. It is apparent also that not all the pertinent information has reached large sections of the public; clearly some people have formed judgments based on unsubstantiated opinions rather than on facts.

This book is an attempt to remedy these omissions; it is complementary to the White Paper and is designed to explain, to clarify, to elaborate upon and in some respects to modify the forest-management and land-use proposals there presented.

A.P. Thomson

A.P. THOMSON,
Director-General of Forests.



THE MANY VALUES OF BEECH

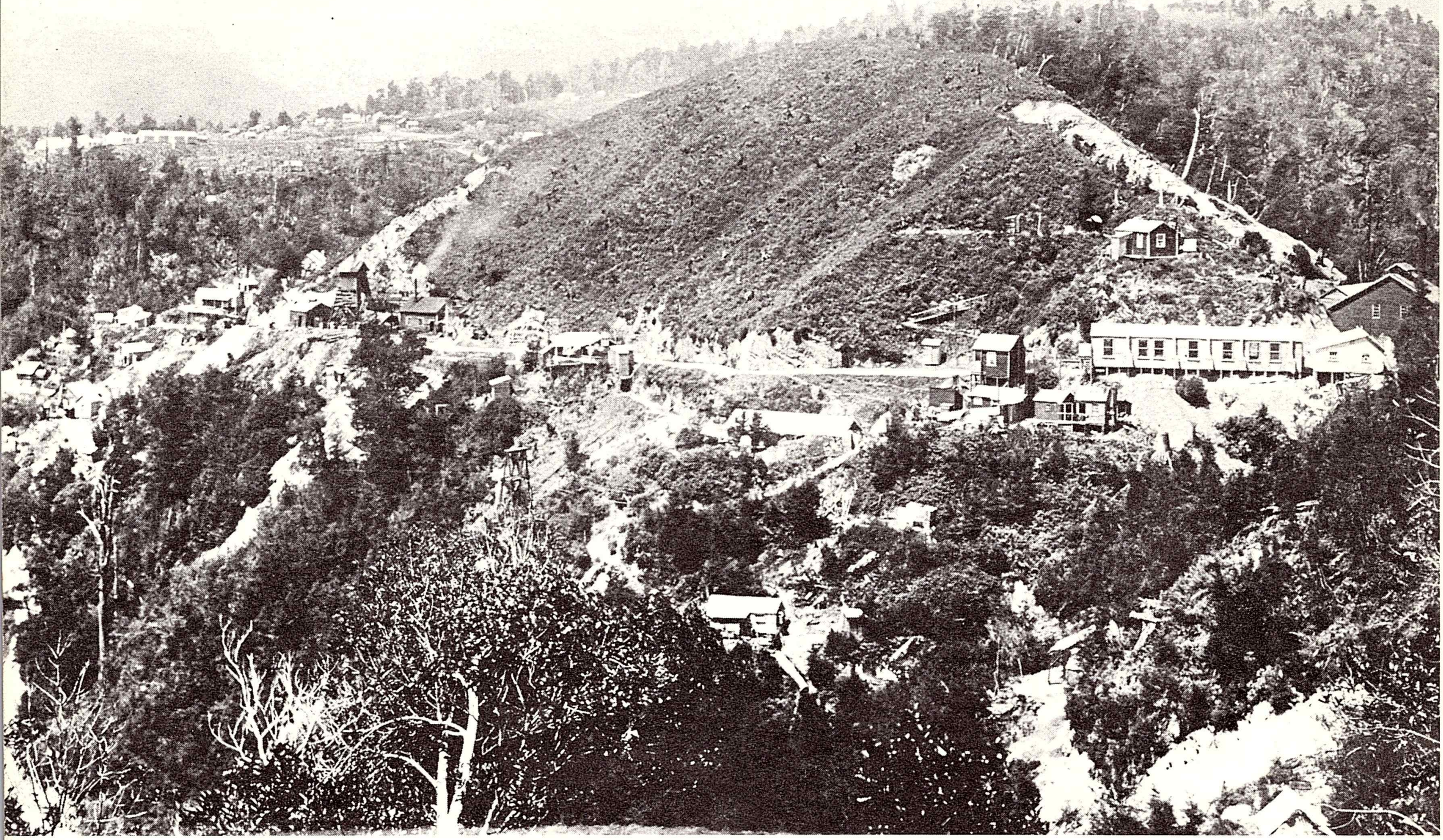
In little more than a century the native forests of New Zealand have been reduced by half to make way for pastures, which are the economic lifeblood of this nation. The 14 million acres of native forest which remain are among our most valuable national resources. The values of the forest are manyfold: productive, protective, scientific, spiritual, scenic, and recreational. As we reach towards maturity as a nation they will become increasingly appreciated and important. The New Zealand Forest Service is the guardian of over half of the native forest area, on behalf of the Government and the public. About a tenth of the area of native State forests is included in the widely publicised and much discussed proposals for the utilisation and management of certain South Island beech forests. It is important therefore to ensure that all New Zealanders understand the intent and scope of the proposals for the future use of those publicly owned West Coast and western Southland forests.

A virgin beech forest alongside Big River, east of the Paparoa Range, Westland. It contains red, silver and hard beeches.

There remain in the South Island of New Zealand some 8.5 million acres of native forests covering almost a quarter of the land area. They extend from sea level to altitudes of 3,500 to 4,500 feet in an almost unbroken tract along the moister western flank of the island. Some small pockets lie to the east of the main range. In the rich South Island flora many different types of forest may be recognised. But for convenience they are divided into two major groups. In the first the predominant trees are the valuable native softwoods known as "podocarps", of which rimu, kahikatea, and totara are perhaps best known to most New Zealanders. The second group, in which one or more of five native beeches is predominant, with or without associated podocarps, makes up about 80% of the total forest area and will be referred to simply as "beech forest".

Soon after its formation in 1920 the Forest Service commissioned the eminent botanist Leonard Cockayne to study the potential of the New Zealand beech forests as a "perpetual source of timber supply" and to report on methods of silviculture which might be employed to achieve this end. Cockayne's classic Monograph on the New Zealand Beech Forests was published in 1926 and dealt with the distribution, ecology, classification, and regeneration of the beech forests. His findings are summarised in his statement:

> "I feel that I can assert with all confidence that in her beech forests New Zealand possesses a perpetual source of great wealth, but only so long as they are properly conserved and managed."



Evidence of the vigorous natural regeneration of beech is shown in the illustrations above and on the opposite page of a South Island mining town and the site 63 years later. Globe Hill and the nearby township of Cousin Jack Town were hewn from the virgin beech forest by gold miners. The picture above was taken in 1910.

THE VIGOUR OF BEECH

The New Zealand beeches belong to the genus Nothofagus (false beech) and were discovered in Queen Charlotte's Sound, Marlborough, during the first voyage of Captain Cook. The five species are:

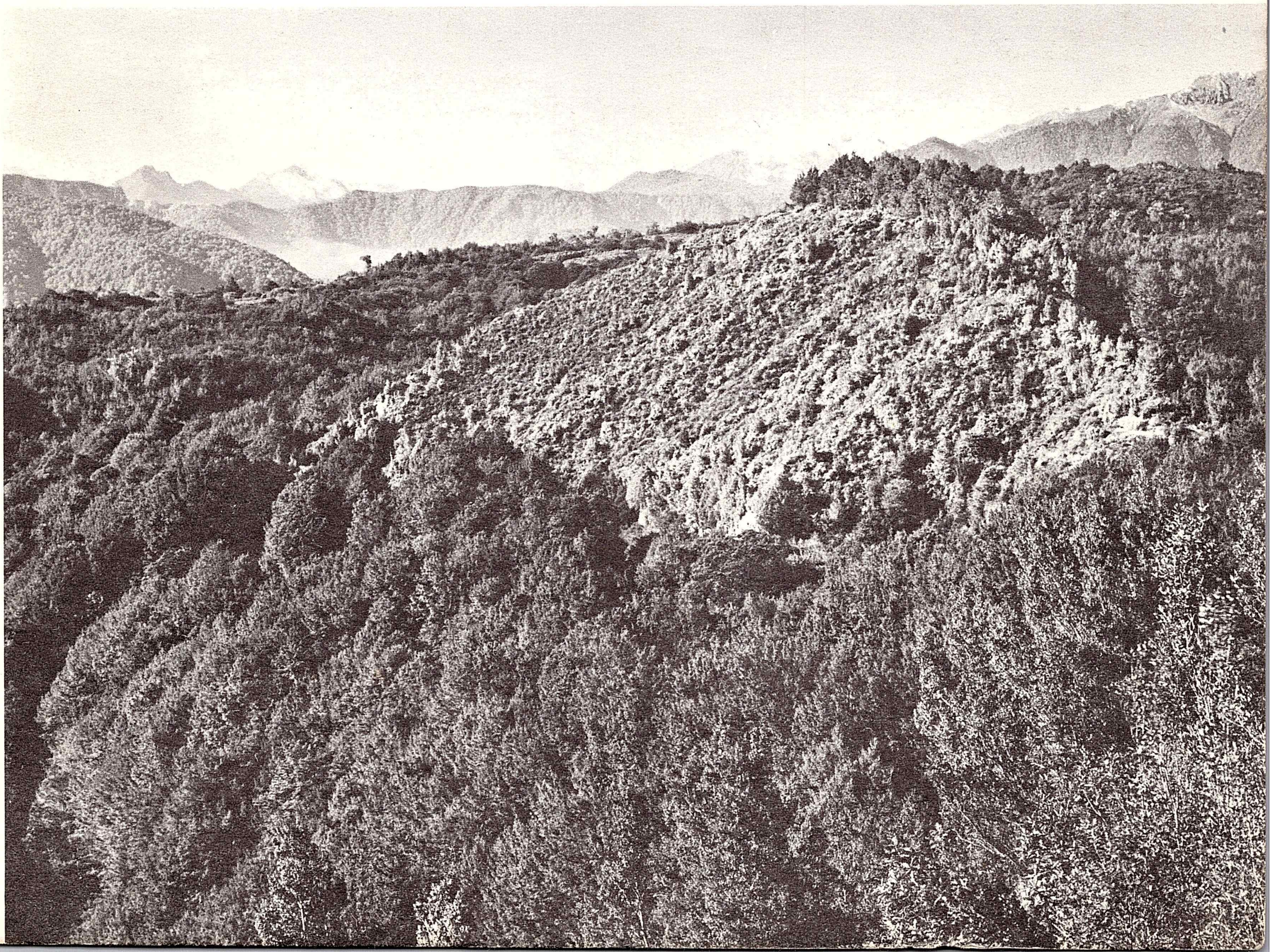
Red beech (*Nothofagus fusca*)
Hard beech (*Nothofagus truncata*)
Mountain beech (*Nothofagus solandri* var *cliffortioides*)
Black beech (*Nothofagus solandri* var *solandri*)
Silver beech (*Nothofagus menziesii*)

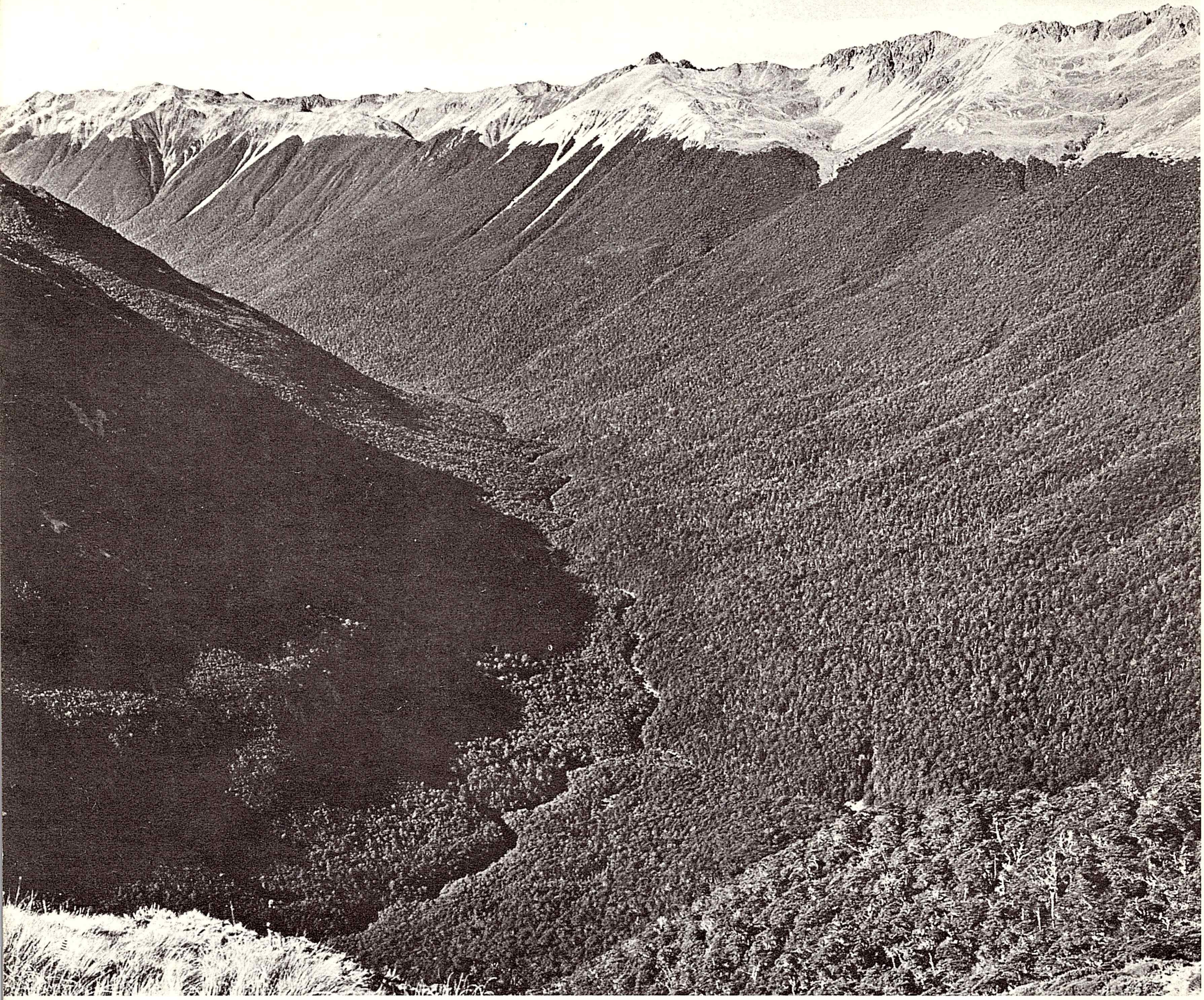
The beech forests are surprisingly varied — from the unusual kauri-hard beech mixture of the Auckland region to the stunted mountain beech — silver pine semi-pakihi forests of Westland; and they occupy a wide range of soils and sites from magnificent and stately red beech on the fertile lowland alluvial flats to grotesquely twisted silver beech scrub at the upper altitudinal limit of trees. Most New Zealanders consciously or otherwise enjoy beech forests. Those who recognise beeches will generally be aware of their aggressive ability to reclaim abandoned land.

In fact the outstanding silvicultural characteristics of the beeches, in comparison with most other native trees, are the vigour with which they regenerate and the rapidity with which they grow. Cockayne noted that in every piece of mature beech forest which he visited regeneration was more or less clearly in progress and that in many localities beech was replacing podocarps. The vigour of beech is evident to the passer-by alongside the roads and under powerlines formed through beech forests. It is demonstrated by the now mature trees that took root 100 years or more ago in the tailings and sluicings of West Coast gold miners and by large areas of natural even-aged forests that have arisen after gales or floods.

Globe Hill and the nearby township of Cousin Jack, near Reefton, were hewn from the virgin beech forest by gold miners. Slowly the abandoned settlements are being reclaimed by regeneration from the surrounding intact forests. The relative vigour and growth rates of beech forests make them the most amenable of the native forests to management for wood production using methods similar to those evolved in Europe over hundreds of years. In the 50 years that have passed since Cockayne's pioneering work more detailed information on the growth and ecology of beech forests has been gradually obtained by foresters. By and large it has merely confirmed his major conclusions, but the proper management which he advocated has never been fully achieved. The reasons for this disappointing lack of progress and the way in which the goal of proper management may at last be reached are the subject of this booklet. The wealth which Cockayne recognised is not confined to production alone and over most of the remaining beech forest area other values are of greater importance.

The picture below was taken of exactly the same place in 1973. Many years ago the miners had abandoned the town and workings when the gold finished. The beech forest is rapidly reclaiming the ground.





The Travers Valley in Nelson Lakes National Park, illustrated above, shows the typical form of the U-shaped glacial valley. Dense beech forest clothes the sides from the river flats to the bush line, 4,500-5,000 feet above sea level, stretching downstream several miles to Lake Rotoiti.

PROTECTION FOREST VALUES

It is fortunate that in the widespread clearing of New Zealand native forests those of the mountain lands were largely spared and were subsequently included in Crown administered State forests and National Parks. The **protection forests** of steep hill or mountain lands have a role in soil and water conservation which overrides all other values. The greater proportion of the beech forest area, irrespective of tenure, is protection forest. Its survival and health is vital to the preservation of the soil mantle covering the main ranges of both islands. In the South Island most of the major mountain valleys have been carved by ancient glaciers, and the rocky rubble on their steepened flanks, if not held in place by forests, would choke the river systems and spill out over the fertile lowlands.

The beech protection forests are also an integral and indispensable part of New Zealand's renowned mountain scenery not only in the spectacular South Island high country but as the forest backdrop to areas as diverse as Wellington harbour, the Desert Road, and the Wairarapa farmlands.

RECREATIONAL VALUES

Recreation is another of the major values provided by our beech forests, the areas of greatest popularity being the mountain lands. The protection forests thus serve a dual role. The Forest Service has recognised the recreational value of such areas by creating State Forest Parks in both the North and South Islands. Beeches form most of the forests of the Kaimanawa, Kaweka, Tararua, and Rimutaka State Forest Parks in the North Island, containing in aggregate 650,000 acres. In the South Island North-West Nelson, Craigieburn, and Lake Sumner State Forest Parks cover an area of more than 1 million acres. In addition Abel Tasman, Nelson Lakes, Arthur's Pass, Mt Aspiring and Fiordland National Parks provide an area of 4 million acres for recreation and preservation of flora and fauna. Not all of the area of these South Island State Forest Parks and National Parks is, of course, beech forest but the beeches provide much of the distinctive character of each.

To the tramper, the hunter, or the family camping on the fringes, the montane beech forests are a beautiful and peaceful antidote to increasing urban pressures.

Young trampers in the Tararua State Forest Park. Below is the Mangatiritiri Stream which winds through protection forests of mountain and silver beech.

Beech forest on the Pomahaka River, Dusky Forest, Southland.

PRESERVATION OF LOWLAND FORESTS

Although the preservation of native plants and animals, soil and water, and scenic and recreational values is well catered for in the mountain land beech forests, it is important that such values are not neglected in the lowlands. The forests around lowland rivers and lakes for example have high recreational and scenic value and must be preserved.

The beech forests on the Pomahaka River, above, lie within some of the country's oldest plantations of exotic trees, in Dusky Forest, Southland, and have been developed to provide a beautiful picnic area by the Forest Service. Even pockets of a few acres may have great value for such purposes.

As the area of undisturbed lowland forest decreases it has become increasingly important to set aside good representative areas for the interest of present and future generations of scientists and laymen. Forest sanctuaries, gazetted under the Forests Act, provide a uniquely strong form of reservation for our flora and fauna, and are being systematically defined throughout the State Forests of New Zealand. Nevertheless, much remains to be done.

Above: The beech forest surrounding Lake Daniells in the eastern portion of the West Coast Beech Project Area is typical of those which are reserved for amenity values.

Below: The friendly bush robin is a familiar sight to those who make the seven mile walk from the state highway to Lake Daniells.

WOOD PRODUCTION FROM LOWLAND BEECH FORESTS

The silver beech forest shown above is not natural. It regenerated after logging in Longwood State Forest, Southland, early this century. It is being tended by foresters to produce a crop of high quality sawlogs and is typical of what might be achieved on a larger scale under planned management of our better quality beech forests.

Those values of lowland beech forest which depend on preservation can be maintained by setting aside appropriate areas and giving them statutory protection. Many of the remaining lowland forests have high potential for management for production of wood and can effectively contribute to the perpetual source of wealth envisaged by Cockayne.

The lowland forests of the world generally are a potentially renewable resource of immense value. Wood will be a versatile raw material long after the stocks of many non-renewable resources such as coal and oil are exhausted. Unfortunately large areas of natural forest have been, and continue to be, exploited without planned renewal. Intensive and intelligent management of forests for wood, such as that developed initially in Europe, is the exception on the global scene. In New Zealand, forest management as intensive and advanced as that in any part of the world is practised in plantations of exotic (introduced) trees, but despite years of experiment and trial much of the native forest is, for a variety of reasons, still logged without specific plans for management after logging. Our resources of land are not so great that we can afford to use our forests in this way indefinitely.

The native forests with high potential for sustained-yield management, such as the red beech of the West Coast and the ch of Southland, offer a challenge ers to ensure that they remain "a source of wealth".

PROBLEMS IN MANAGING THE BEECH PRODUCTION FOREST

The widely publicised Forest Service proposals for fuller utilisation of beech production forests and beech forest land in Southland and the West Coast are simply a means of tackling the longstanding problems of inefficient use and management of these forests and forest soils. The motivation behind them has been widely misinterpreted by those with little direct knowledge of the problems. Over the past two years the proposals have been subjected to an environmental examination of unprecedented depth by many well qualified people within and outside of Government. The examination was invited by the Forest Service and has by and large endorsed the department's planning principles and its general aims including a partial and limited conversion to exotics. Nonetheless the impression continues to be fostered by small, vocal and less responsible groups that the proposals are motivated primarily by economic greed, that the forests would be destroyed by a "cut out and get out" approach, and that valuable beech sawlogs would be chipped as a result of pressures from foreign interests. Nothing could be farther from the truth.

Before discussing the details of possible utilisation and subsequent forest management it is therefore important to understand the problem. There is nothing new about utilising beech forests; they have been a source of valuable wood for over 100 years. They have always been used wastefully by "creaming" them for the best sawlogs and leaving the rest. Attempts to manage the forests by classical methods of silviculture have been frustrated by the absence of a market for the poorer logs. Unless such a market is developed the "proper conservation and management" of beech production forests will remain unattainable. The motivation for the Forest Service proposals is therefore threefold and stems from:

- The need to make use of wood at present wasted in the forest and in the mills.
- The desire to end the long era of exploitation and to manage all production forest lands for a sustained yield of wood.
- The recognition of the social benefits which would result from the better short- and long-term employment opportunities provided by efficient processing and sustained-yield management of forests.

The problems have been recognised by foresters for many years but until recently the technology which might offer a solution has been insufficiently developed and no market has existed for lower quality wood.

Good quality beech sawlogs.

GOOD QUALITY SAWLOGS

Silver and red beeches produce fine decorative woods whose even texture and good machining and finishing properties make them suitable for furniture, turnery, and manufactured wooden ware. Black, hard and mountain beeches are inferior woods to silver and red beeches, and specially hardened saw teeth have to be used for cutting them because of their silica content. Beech timbers generally require more care in sawing and seasoning than most other New Zealand timbers. Therefore, despite the excellent intrinsic properties of silver and red beeches the production of beech timbers over the last 50 years has been small and has fluctuated considerably.

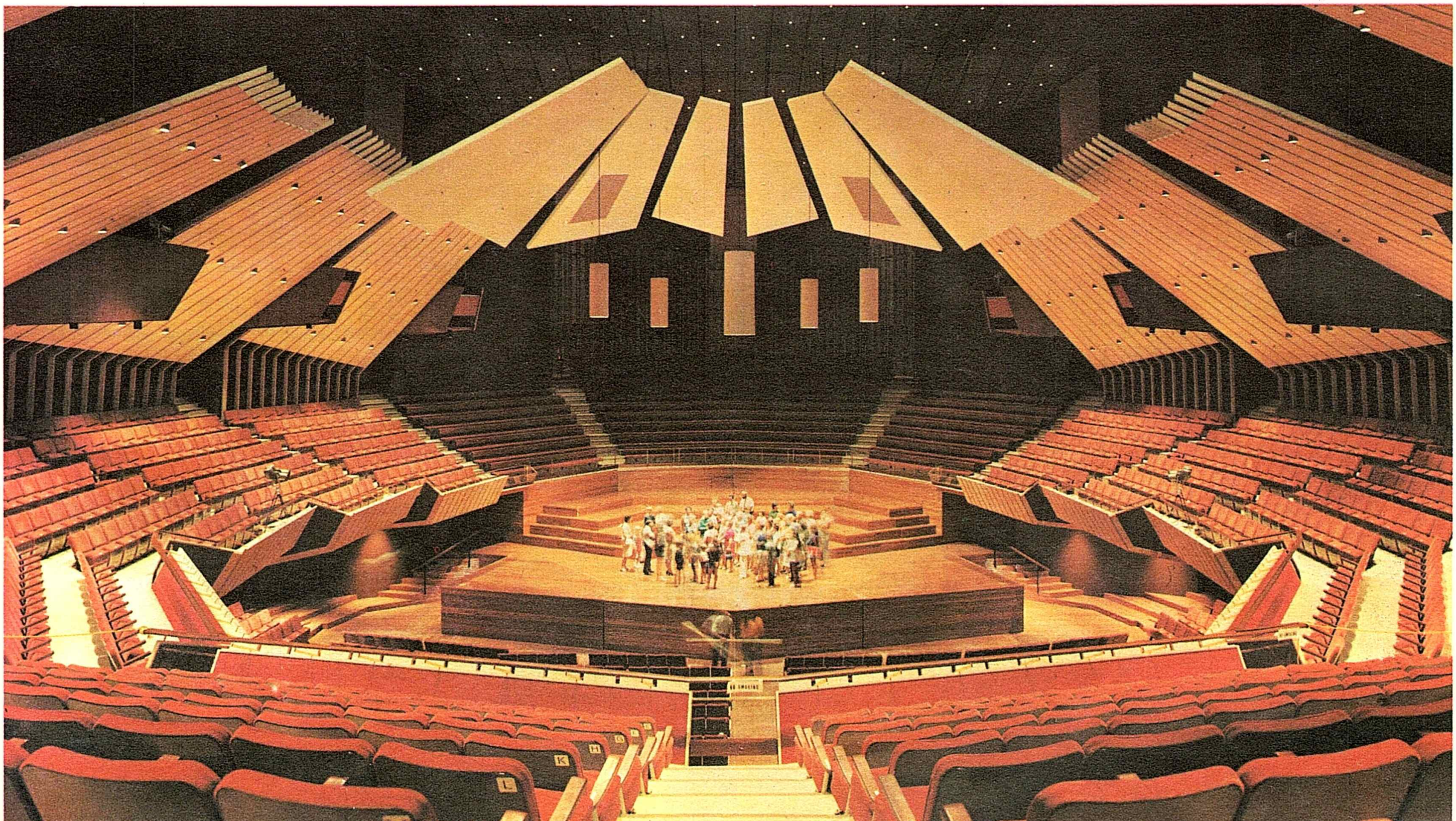
The illustration above shows excellent Southland silver beech sawlogs. However, only about a quarter of the silver beech in the logged-over forest is of high enough quality to saw economically; at present the rest remains as waste.

The beauty of sawn red beech as panelling and furniture timber is well illustrated (top right opposite) in the Hokitika office of the Forest Service, a showcase for decorative use of local woods.

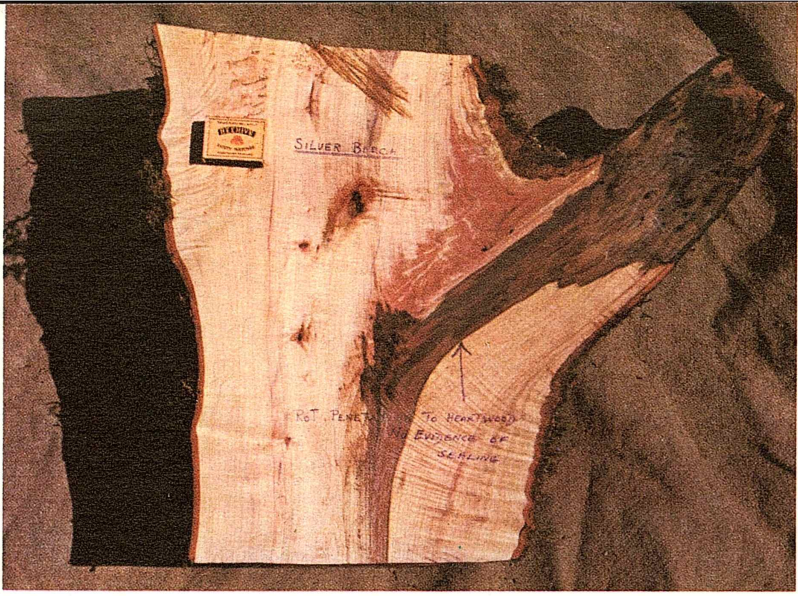
The beauty of wood generally is spectacularly displayed in the auditorium of the Christchurch Town Hall. In the past the podocarps, particularly rimu, have met many of the decorative needs in homes and public buildings but as supplies continue to dwindle the beeches must play a more important role. Better use of beech sawlogs is as important to the Forest Service proposals as outlets for poor quality logs.

Right: The attractive colour and texture of beech timber are shown in this panelling and desk in the Hokitika office of the Forest Service. Only a proportion of red beech trees is sound enough to yield such timber. Proposals for better utilisation of beech forests include maximum use of good logs for high quality products. For example the New Zealand furniture industry could use much more red and silver beech timber.

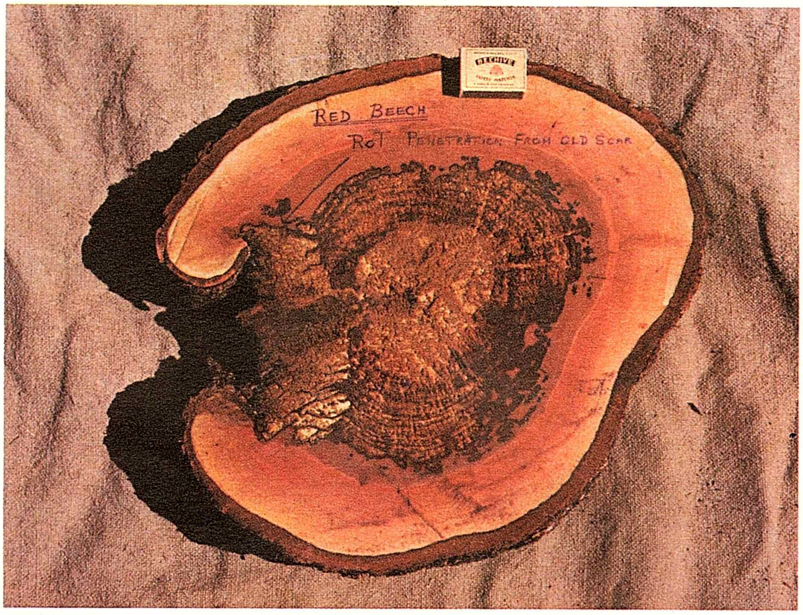
Below: The interior of the new Christchurch Town Hall strikingly displays the beauty of wood. Plantations of introduced trees cannot meet all decorative and functional needs and either native or imported timbers must be used. The beauty of our own timbers has not been sufficiently appreciated in the past.



DEFECTIVE AND POOR LOGS

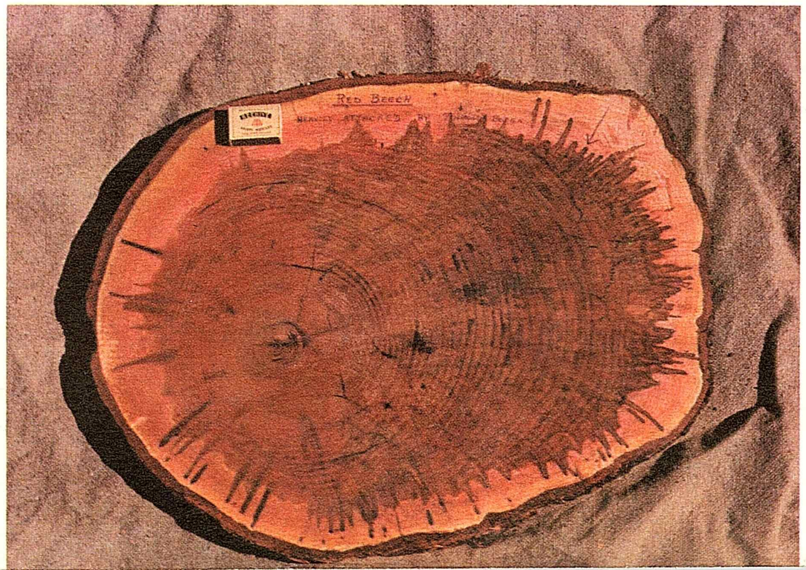


Rot in the heart of silver beech.



Rot in the heart of red beech. *Photos. Robin Cutler. N.Z.F.S.*

Degrade of red beech caused by pinhole borer attack.



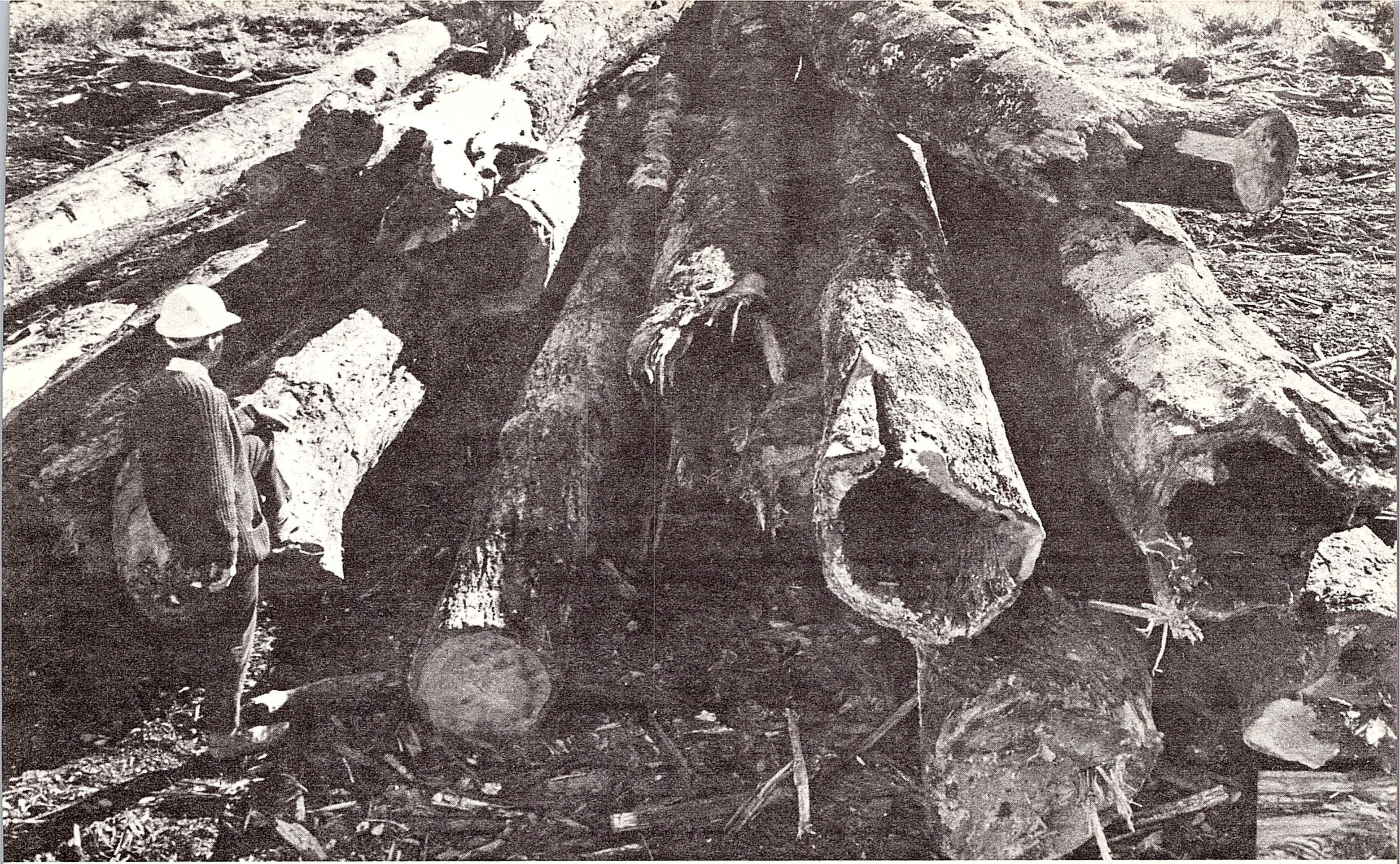
Those who advocate management of beech forest for high quality timbers alone, with no industrial outlet for defective logs, are impractically idealistic. Fifty years ago Cockayne remarked how large and decayed many beech trees were and suggested that "the beech forests in general are so over-mature that the sooner they are milled the better. It is probably to no small extent this overmaturity of the trees which has led to their unsatisfactory condition."

Beeches are very susceptible to rots. The upper illustration shows one of the ways in which the fungi that cause decay of the heartwood can enter the tree. A branch deprived of sunlight as the tree has grown upward has died, and provides the weak spot for the attack. In the middle illustration the bark of a tree has been wounded, perhaps by a blow from a falling dead tree. The invading fungus has again overwhelmed the tree's defence mechanisms. Insects too are capable of severely damaging or killing beech trees. The lower illustration shows the blemish resulting from the commonplace "pinhole" (in red beech), which is caused by the Platypus borer and its associated fungus.

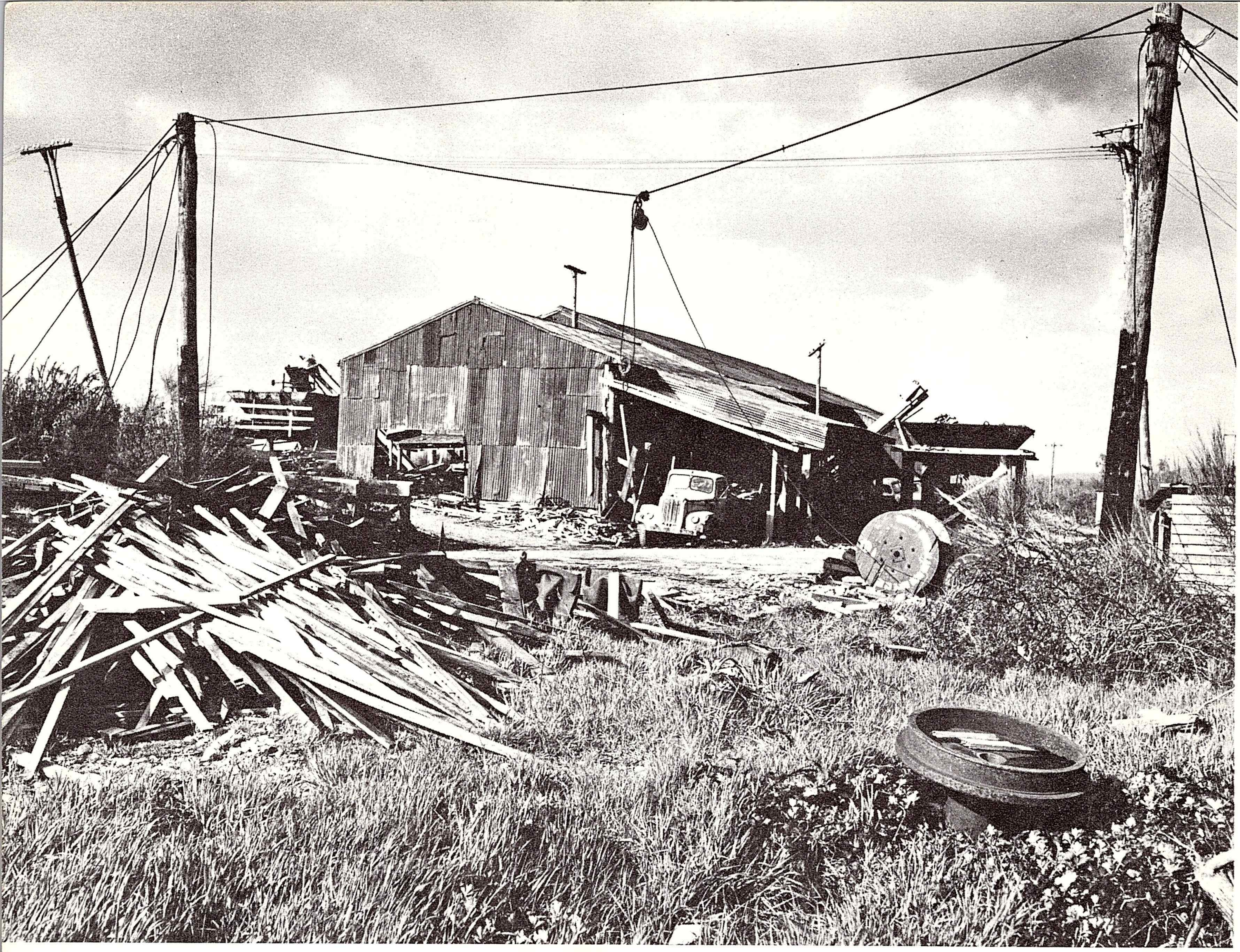
The logs shown on the opposite page are typical of misshapen or rotten beech which is quite unsuitable for sawing. In Southland about three-quarters of the total wood in the silver beech production forests is defective. A detailed assessment of the West Coast beech production forests, involving the measurement and felling of many trees, reveals that only 20% of the wood of sawlog size is defect free. Because of hidden defect there is considerable wastage from logs that are being sawn at present even when they are carefully selected. In Southland only about half of the solid volume of sawlogs ends up as sawn timber and on the West Coast the proportion is less.

The slabs or offcuts are burnt or dumped. To make use of these forest and mill wastes they must first be chipped or otherwise processed and then manufactured into some usable product. Among the possible materials are pulp and paper. During the past decade or so there has been a major trend in the world pulp industry towards the greater use of hardwoods. Several processes would be suitable for converting otherwise wasted beech to paper. The technology thus exists to solve the long-standing problem of inefficient utilisation of beech forests because of inability to use a large proportion of the available wood.

Upper right: A "run of the bush" load of defective logs awaiting chipping in Nelson.
Lower right: Beech chips in stockpile.



Photos. Geoffrey C. Wood. Studio Ltd.



An old West Coast sawmill.

A TALE OF TWO MILLS

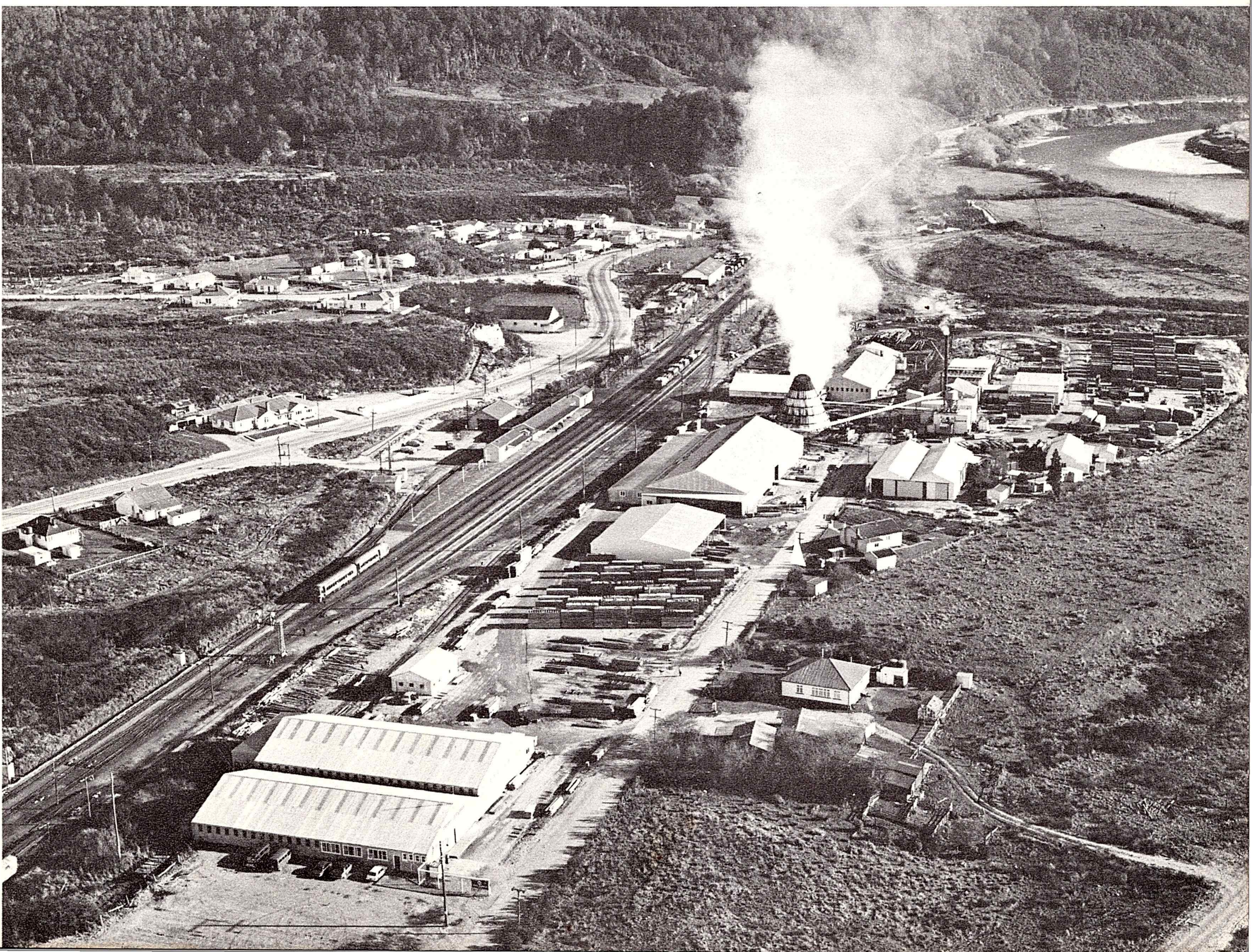
There is nothing new about the quest for better utilisation of native forests. This was one of the facets of forest practice given greatest prominence by the newly formed Forest Service in the 1920s. About eight years ago a policy of long-term sales of native timber was introduced. The object was to give greater security to the sawmilling industry and greater stability to communities dependent on this industry. A key condition of such sales is that there shall be a higher degree of local processing. In Westland and Nelson Conservancies 27 long-term sales have been made dating from 1965 and expiring in 1986-91. They involve 50,000 acres of (mainly) podocarp forest and 125 million cubic feet of timber.

The two West Coast mills illustrated above and opposite are within five miles of each other. The first is typical of mills built in the days of short-term sales and milling of rough sawn green timber only. The second, constructed as a result of the security provided by a Forest Service long-term sale agreement, saws and further processes timber, providing stable employment for 100 people. But this security must be relatively short-lived unless second crops of forests, either exotic or indigenous, are deliberately planned and grown. Even with the improved utilisation by modern mills of this type potentially usable wastes are burnt.

Utilisation of beech is generally of secondary importance to West Coast sawmills. The podocarps, being less defective, more easily sawn, and seasoned, and more readily salable are the "bread and butter" resource. Good quality red and silver beech logs are sawn when markets are buoyant but hard and mountain beeches are virtually unsalable. As a result the mixed beech-podocarp forests are selectively logged for rimu and the best beech. Because hidden defect is commonplace, doubtful beech sawlogs remain in the forest. The cost of felling, carting and preparing a beech sawlog is the same whether it proves to be blemish free or a mere shell.

No improvement in the use of beech as a sawn timber or veneer and in better marketing for high quality uses can be expected in the absence of viable markets for defective trees and logs. If such markets could be developed it would allow all trees, other than those required for regeneration, to be removed in logging. Logs could then be sorted into those worth sawing or converting into veneer and those to be chipped; full and controlled use could be made of the products of the forest according to the value of each. This is the first part of the motivation for the Forest Service proposals.

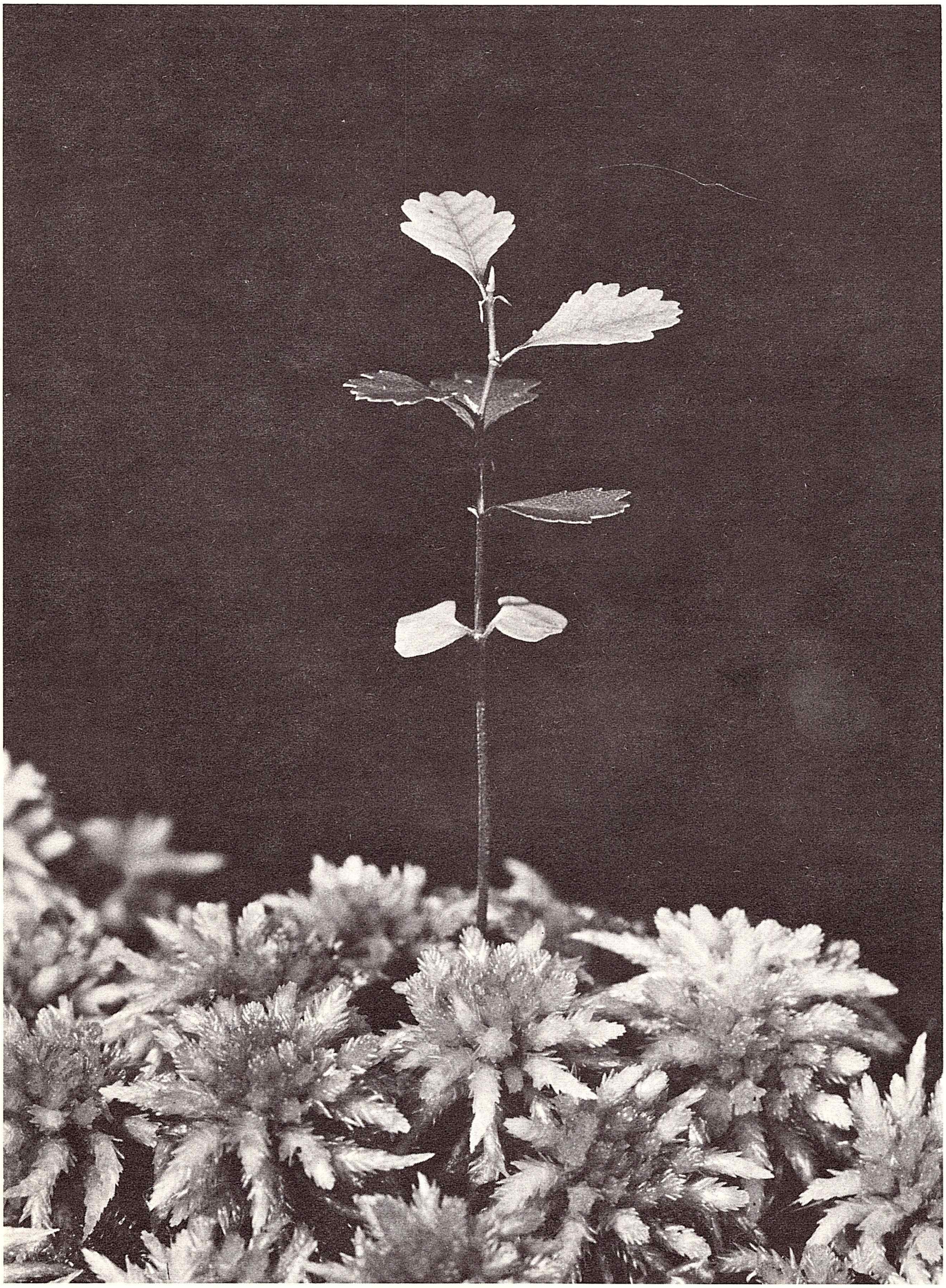
A West Coast sawmill recently built based on long term wood sales.



A BEECH FOREST NEEDS LIGHT TO GROW

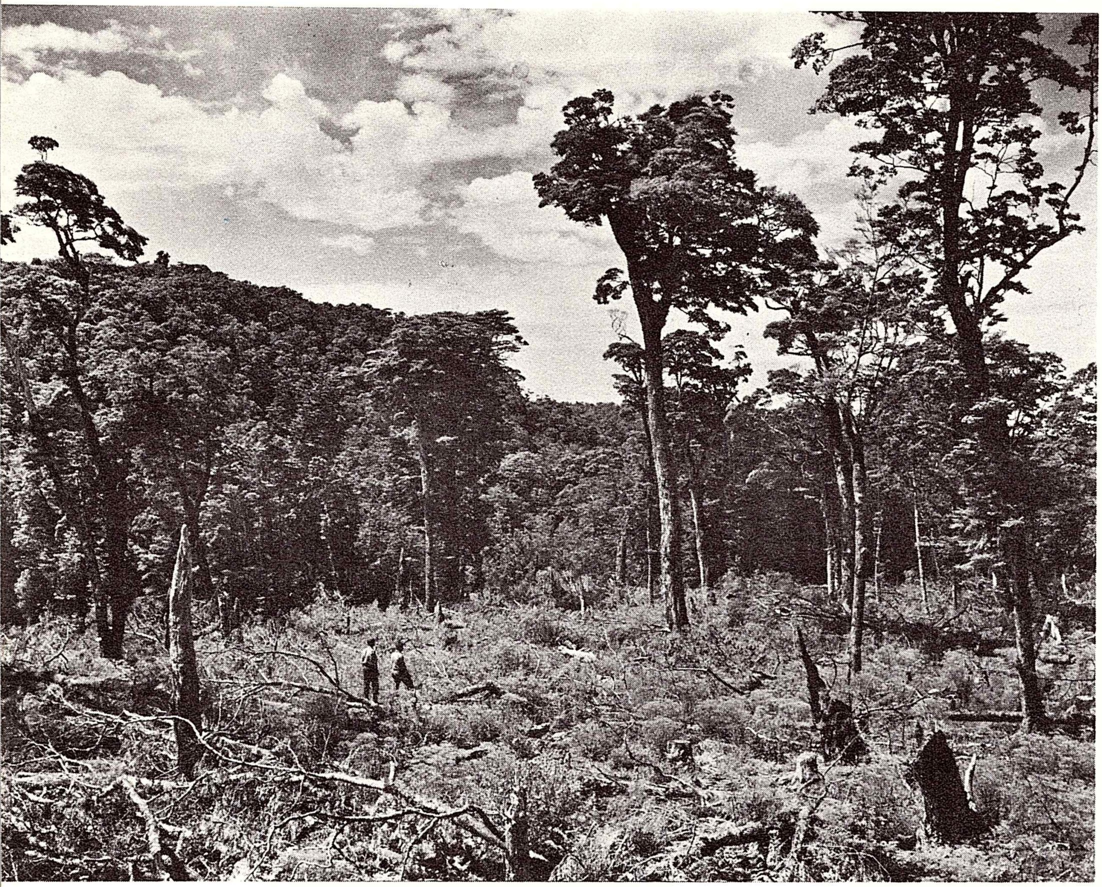
The second part of the motivation is concerned with the future of the logged-over forest. To understand why better utilisation would pave the way for better forest management it is necessary to know something of the way in which a beech forest regenerates. From the earliest Forest Service investigations onwards it has been known that the rate of growth of regenerating beech varies according to the amount of light received by the young seedlings. Cockayne recorded "that development in full light outside the forest was at least three times as rapid as in a well lit forest interior". More recent work has shown that the differences are even greater than he supposed and that beech seedlings commonly stagnate entirely under the shade of a forest canopy. Conversely the survival of young seedlings is greatly improved if they are protected by some shade from the drying and scorching rays of the sun. Survival is also increased by disturbing the leaf litter and humus of the forest floor to expose the mineral soil. These are the basic requirements for the successful regeneration of beech. At intervals of about three to seven years, particularly after a hot dry summer, heavy seed falls known as "masts" occur. If the seedlings resulting from these falls can be fostered under the shade of the mature forest, it can subsequently be clearfelled and the full light thus provided for rapid growth of established seedlings. Seed trees can be left to seed gaps resulting from logging. Successful regeneration thus depends on skilled silviculture and a good knowledge of the ecology of the forests. Management of beech forests is not a simple task.

If a beech forest is merely selectively logged for the best sawlogs, the residual cover of defective trees usually provides too much shade to allow regeneration to grow. This is the difficulty faced at present. The cutover forest then remains indefinitely in an impoverished condition having neither the value of an intact virgin forest nor that of a vigorously growing second crop. Only better utilisation of defective trees can break the deadlock.



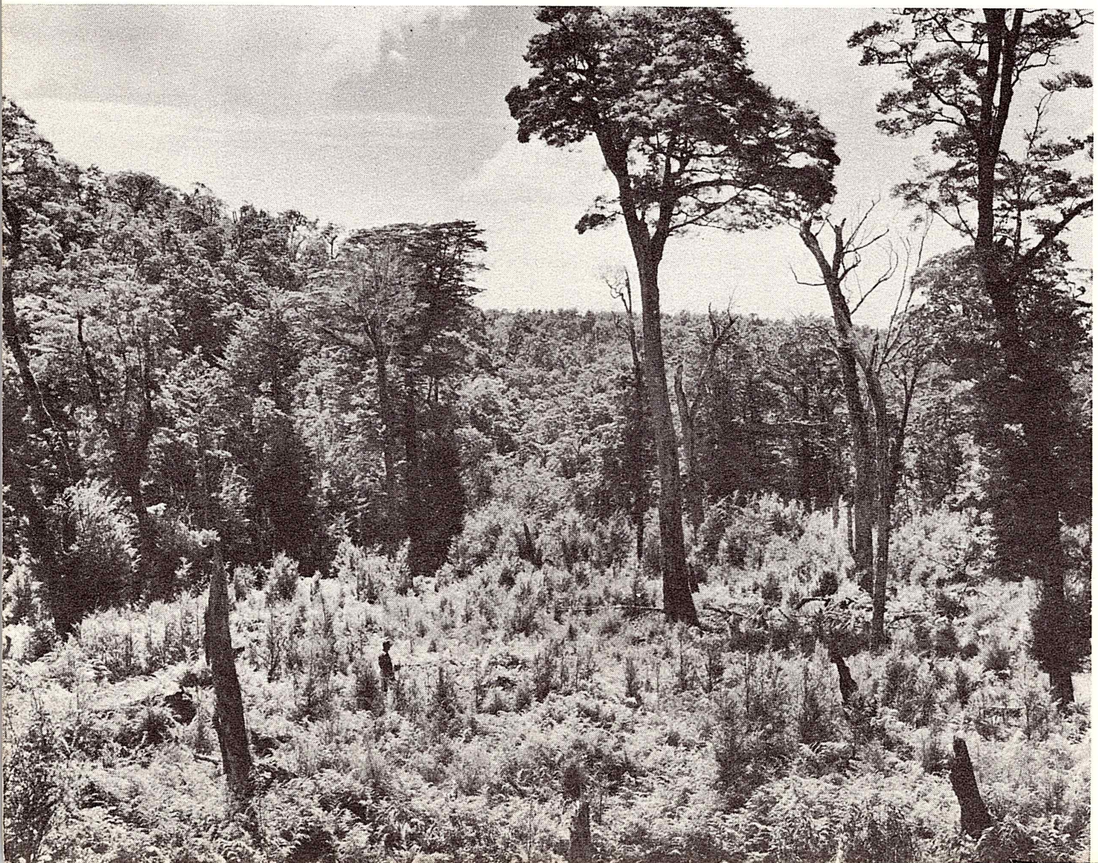
A first-year silver beech seedling which has germinated from a seed trapped in the moss of the forest floor.

PLANNED REGENERATION



1952

1958

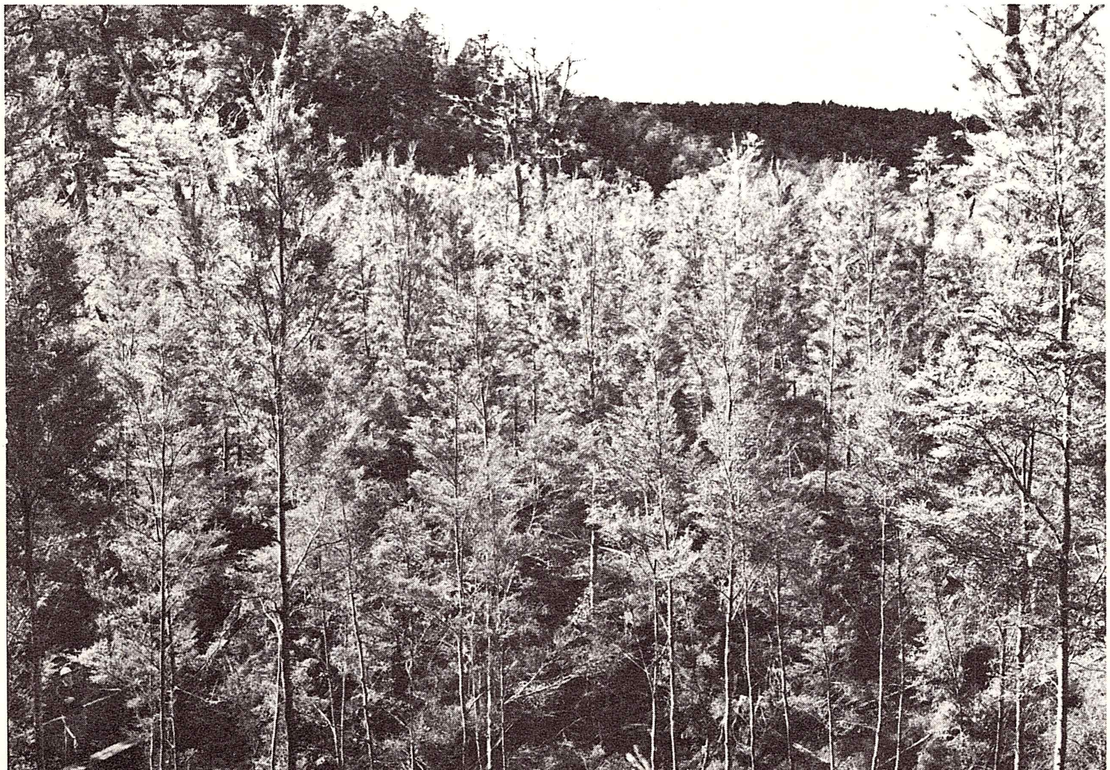


The management of silver beech forests in Rowallan Forest in Southland has been under way for many years. The sequence of photographs taken from the same point at intervals over 20 years clearly shows the development of regeneration. The dense crown fern of the forest floor was grubbed out by hand in 1950 to prepare the ground for a heavy seedfall. Seed trees are clearly shown in the illustrations. Profuse regeneration resulted, but it was gradually smothered by water fern and other competing weeds. Slowly it asserted its dominance and in the second photograph, taken in 1958, averaged 7 feet in height. By 1970 a dense sapling crop was established and in the most recent photograph, taken in August 1972, this has been recently thinned at a height of about 30 feet. Experience in other forests of the region shows that a sawlog crop will be obtained in a further 60-80 years. Although growth is rapid in comparison with that of other native trees it should be appreciated that a crop of radiata pine grown on the same site would by now be approaching a harvestable size. The justification for beech management does not therefore rest on economic considerations alone but to a large degree on the less tangible values of perpetuating the native forests.

To obtain a second crop of silver beech by the method shown it is necessary at present to "cull fell" the substantial quantity of defective wood left after logging. Such wastage is obviously intolerable if a solution to its use is apparent.

1970

Aug. 1972



Windthrow in Hochstetter State Forest.

NATURAL REGENERATION

Trial work on regenerating West Coast beech forests has also been underway for many years but here observations of the pattern of development in selectively logged forests and after natural calamities provide much of the evidence on regeneration processes. As the beeches are shallow rooted trees, widespread natural windthrow is not unusual. The first illustration shows large-scale windthrow in Hochstetter State Forest in the early 1950s in an area with a history of repeated windthrow and regeneration. Despite the apparent chaos the seedlings established prior to the storm have subsequently restocked the area.

The history of the fine stand of red beech poles, at Waipuna, in Granville State Forest, has been carefully pieced together by analysing the growth rings of individual trees. This even-aged stand had its origin in a windthrow of a similarly even-aged stand over 50 years ago. On this fertile site 2,500 cubic feet of wood per acre have been produced in 50 years. To place this in perspective, radiata pine might be expected to produce 15,000 cubic feet per acre over the same period.

A red beech pole stand 50-60 years old in Granville State Forest.

Red beech saplings growing vigorously in a clearing on the West Coast.

MANAGEMENT SUMMARY

To summarise, the successful management of beech forests depends on securing good regeneration and allowing its rapid growth by clear felling the overwood of mature trees. In the illustration above the red beech saplings in the foreground are growing vigorously in full light. The heavy cover of defective trees in the background completely precludes the development of the new crop there.

The photograph below shows a hard beech-rimu forest logged earlier this year in Hukawai State Forest. The rimu has been removed but the unsalable hard beech, other than that felled in logging the rimu, remains. Until a market is developed for this species and for defective trees of red and silver beeches the forest cannot be managed intensively as a valuable renewable resource. Better use of wasted wood and better forest management go hand in hand.

Recently logged hard beech forest in Hukawai State Forest.

ZONING OF THE BEECH PROJECT AREAS

The problem of better use and management of beech forests is one of using lower value logs and sawmill wastes. To solve it, defective and waste wood must be chipped and processed into salable products. Although relatively small scale plants can process wood chips for panel boards, manufacture of pulp or paper usually requires a large plant with a corresponding input of wood.

If all possible options for the best use of the beech forest are to be objectively weighed the maximum area available for wood supply must be defined at the outset and the maximum sustainable input of wood must be calculated. Definition of these ceilings does not in itself imply that the biggest industry is the most desirable, or the only option, but obviously the limits of any resource must be known if plans for its use are to be soundly based. The Forest Service approach in the West Coast and Southland beech project areas has been to zone for wood production, on a renewable basis, only that area which demonstrably was not more important for other purposes. Value judgments must be made and for this reason the zoning has been open for public criticism and comment. Having defined, and as necessary refined the maximum productive area the intention has been to invite proposals from industry for the use of the wood it contained. The nature and scale of the industry finally accepted must depend on social, economic, and environmental considerations, requiring most careful scrutiny of all proposals. This has been planned from the outset.

In developing the broad proposals the Forest Service was conscious of the need to preserve the various non-production values of the beech forests discussed earlier. Planning proceeded as follows:

- The first step has been to map the protection forests. In the initial zoning, high country was defined as land above 2,500 feet in the West Coast and 2,000 feet in Southland. Refinement of the protection forest boundary will be based on detailed appraisal of forest, geological, and soil types in consultation with catchment authorities.
- Within the remaining potential production area two further categories of land have been delineated for reservation:

  Amenity reserves to preserve scenic and recreational values particularly along highways and rivers and around lakes.

  Biological reserves for preservation of flora and fauna. Provision has been made to expand or create additional reserves for native fauna and most of the biological reserves will be given Forest Sanctuary status when faunal requirements have been decided and boundaries finalised.

  Lowland reserves total 70,000 acres in the Southland, and 100,000 acres in the West Coast project area.

  Legislation is to be enacted to give statutory recognition to reserved forests generally.
- The area of forest remaining after delineation of protection forests and reserves has been regarded as the maximum area from which wood could be drawn to satisfy any specific proposals that might be made. Viable proposals requiring a lesser area are in no way precluded, but if pulping proves to be the only satisfactory means of using otherwise wasted wood the full potential production area could well be needed.
- Should this happen the beech forests could not sustain in perpetuity an industry on the scale which may prove to be necessary. A supplementary resource would have to be provided within economic hauling distance of the industrial site, in order to provide wood supplies for the industry's future needs. Such a supplementary wood supply could only be provided, in the time available, by exotics. It has therefore been considered essential to zone for conversion to exotics areas not well suited to sustained-yield beech management but which could nevertheless grow healthy and renewable exotic plantations.
- The area ultimately converted to exotics will depend on both the balanced use of the land and the requirements of the industry best able to fully utilise existing forest resources. The areas zoned for conversion are maxima. On the West Coast the possible conversion area has been increased from 194,000 acres to 241,000 acres. This is a result of the inclusion in the West Coast project area of State forests lying between Greymouth and Hokitika — a recommendation of the Officials Committee for the Environment and the Environmental Council. The additional area is almost entirely podocarp-hardwood forest, without beech, and much of it has been cut over. As a result about a third of the total area that may be converted is podocarp-hardwood forest. Although this will allow

some virgin beech forest areas to be re-zoned for beech management, their precise location and extent must be determined carefully as part of the continuing refinement of the proposals. Within the area converted to exotics the reservation of streamside strips and of green belts for fauna and for aesthetic improvements will further reduce the gross areas shown in the following maps and diagrams. Should the projects proceed the area finally converted will be within that shown as possible exotic plantation on the maps. A maximum area of 200,000 acres could eventually be required on the West Coast if a major scheme eventuates.

Within the Southland project area the 152,000 acres zoned for conversion is also a **maximum**. Refinement in this project will include a closer examination of forest types in Waitutu State Forest to identify areas of possible beech management.

- It is proposed to manage all the production forest area other than that which is finally converted to exotic plantation or farmland (a small area on the West Coast) as native forest. On the West Coast this area totals 343,000 acres of which 255,000 acres will be regenerated predominantly in beech, 33,000 acres on infertile high terraces will be selection logged for podocarps and 55,000 acres of "semi-pahiki" forest on the most impoverished terraces will be simply left in its present condition.
- Within the forests zoned for beech regeneration the forests with highest potential, mainly dominated by red and silver beeches, will be managed for sustained yield over an 80 to 100 year cycle. On the West Coast about 100,000 acres including forests of the Maruia Valley are zoned for sustained yield and in Southland all of the area currently or ultimately zoned for beech management will be cut on a perpetual-yield basis.
- The remaining beech management area on the West Coast, totalling about 150,000 acres, has been zoned for possible supplementary planting as described below

Vigorous young eucalypt saplings growing in mixture with patchy regeneration of red and silver beeches.

SUPPLEMENTARY PLANTING

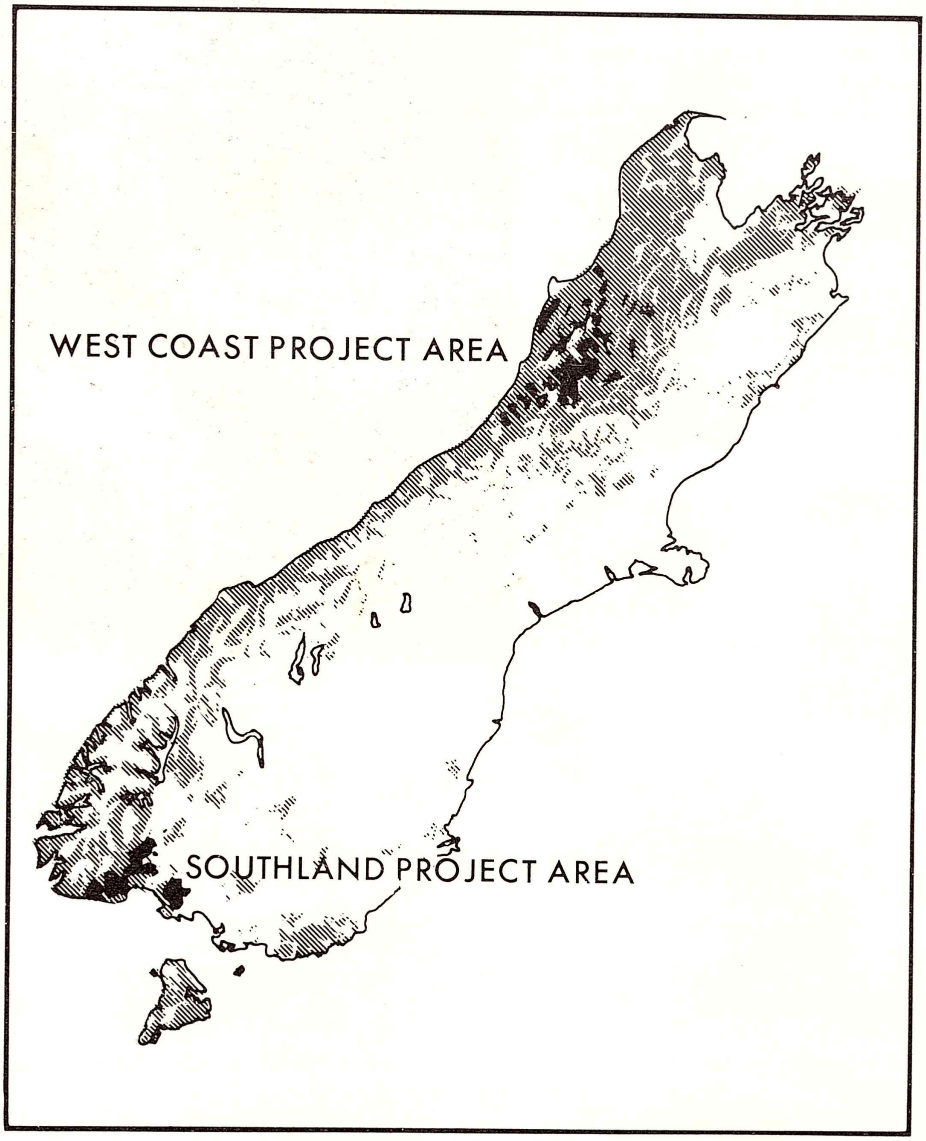
Beech forests zoned for "enrichment" are generally dominated by the lower-valued hard beech and the use of exotics is regarded as a contingency to be used where the securing of adequate beech regeneration proves difficult. The supplementary exotics would be eucalypts of proven commercial worth. As well as maintaining productivity they could help to provide more suitable conditions for the establishment of a beech crop. The eucalypts are quite compatible with beech in mixed stands, are aesthetically pleasing, and have similar wood properties to beech. They could eventually be logged carefully to leave the second growth beech forest to grow to maturity or they could be carried through on a long rotation with the beech.

LOCATION AND SIZE OF THE PROJECT AREAS

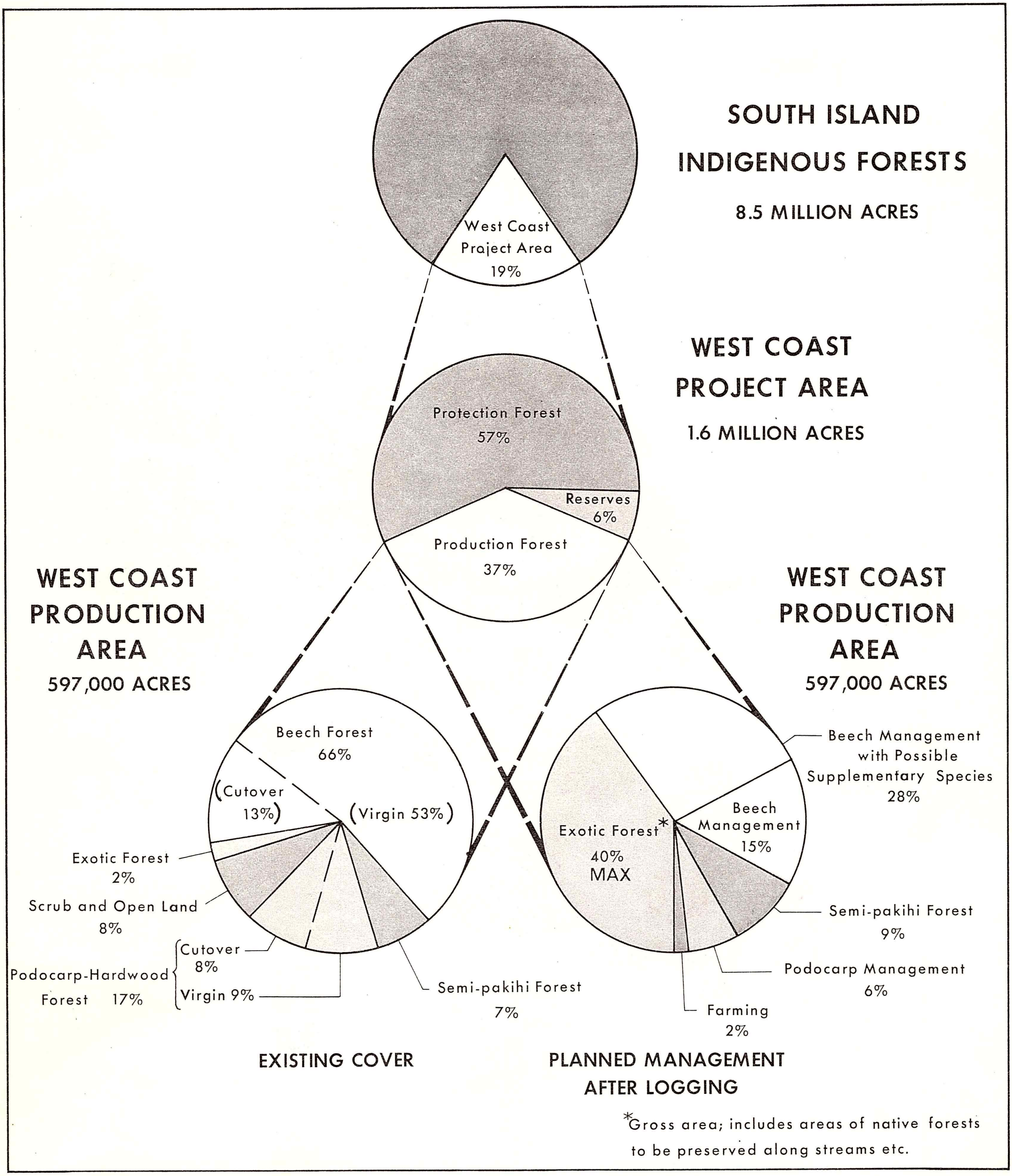
The dark shading on the map of the South Island below, shows the general location of the State forests included in the Forest Service proposals. The lighter shading shows the total extent of the South Island forests.

In the more detailed maps and diagrams which follow an attempt is made to convey as clearly as possible the scope of the projects. As previously stated those areas zoned as production forest, including possible exotic forest, are maxima. The area of biological reserves has not been finalised and all area data remain provisional.

The "project area" embraces all State Forest land within or adjacent to the areas zoned for production and management, including the neighbouring protection forest lands. It does not include other forested lands of the Crown e.g. Scenic Reserves, or of freehold or leasehold tenure. The addition of unreserved lands adjacent to State Forest where they are in forest or scrub would provide greater flexibility in planning and subsequent management.



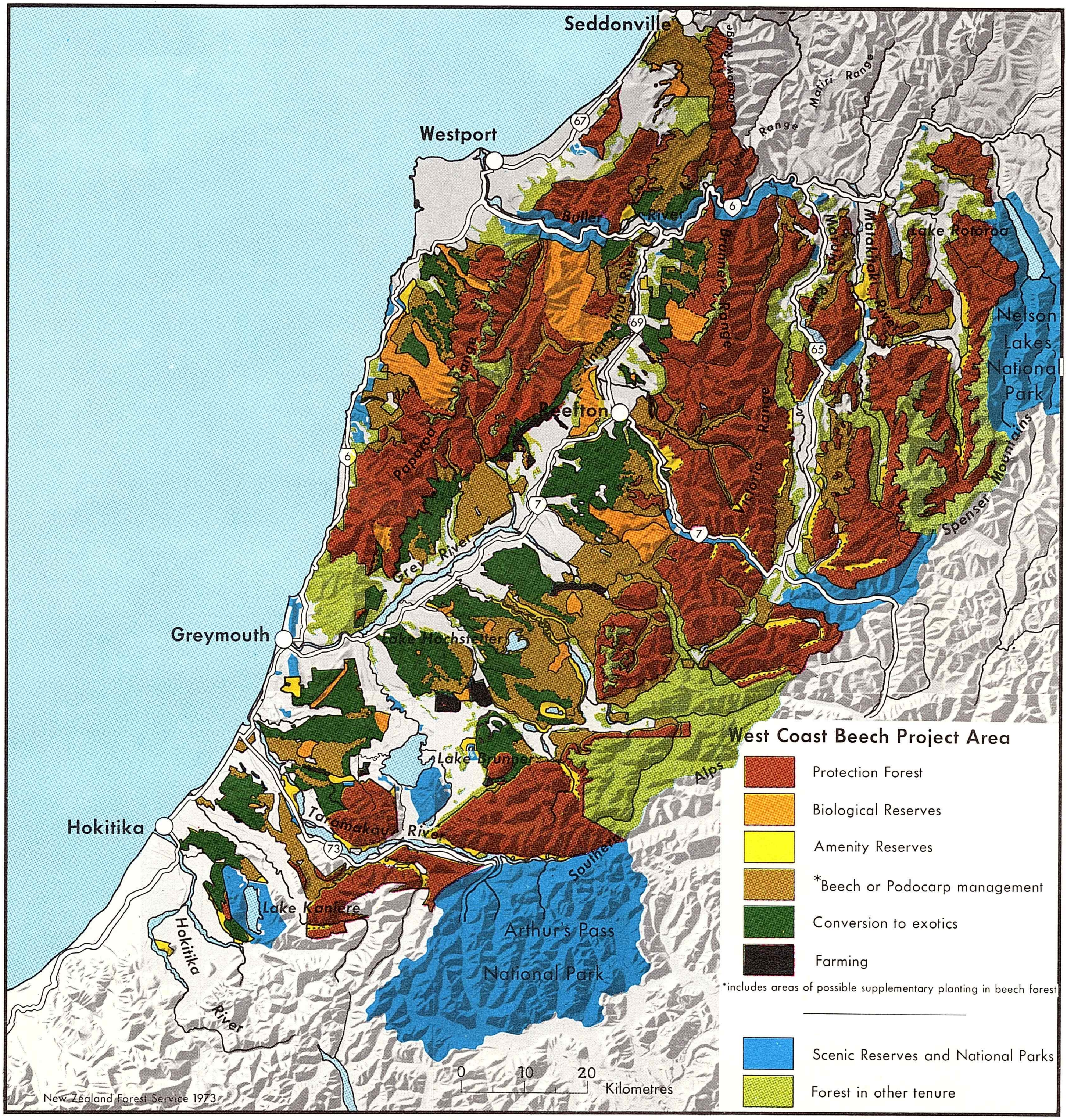
AREA BREAKDOWN WEST COAST PROJECT AREA



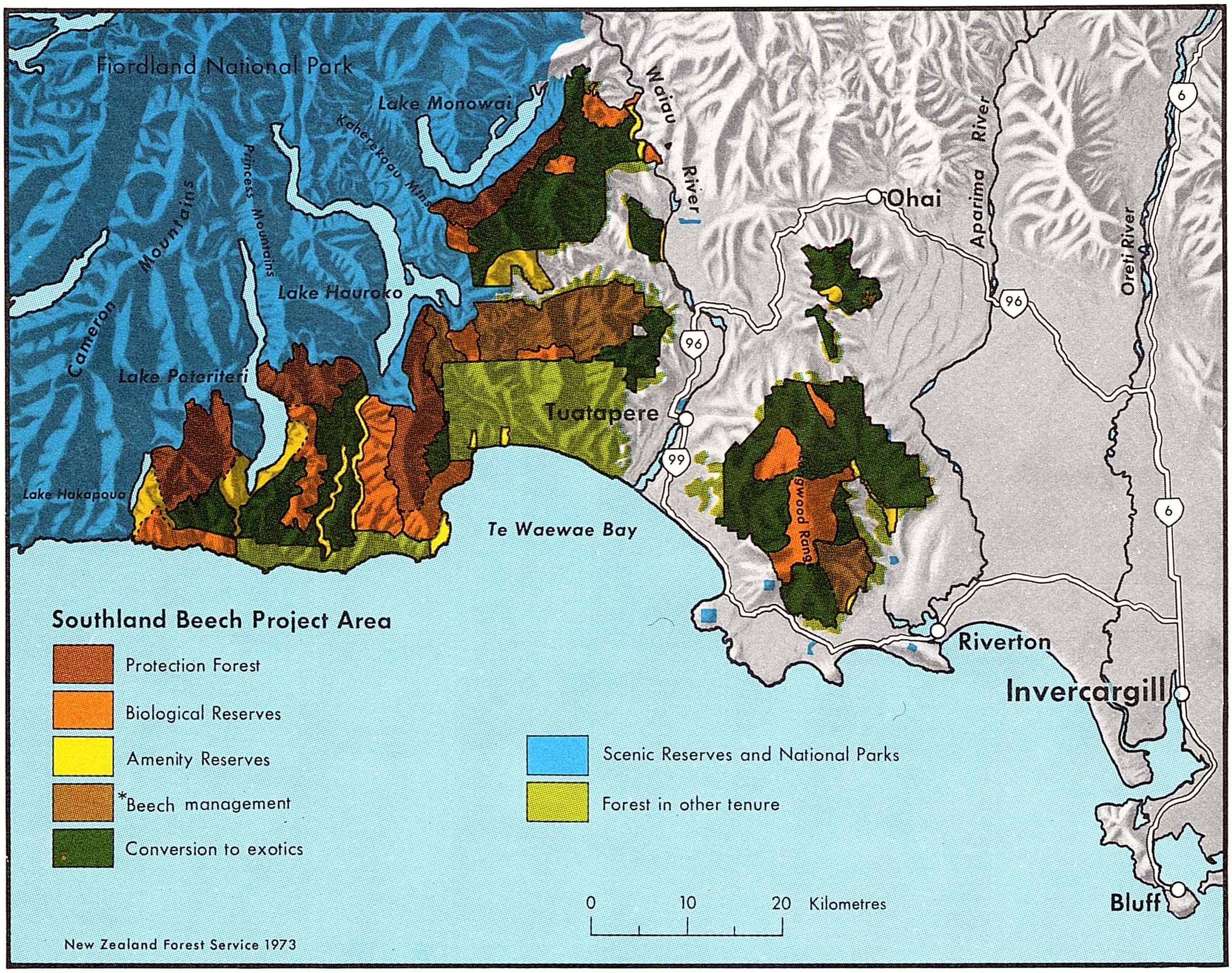
*Gross area; includes areas of native forests to be preserved along streams etc.

FOREST CLASSIFICATION, WEST COAST PROJECT AREA

The area data shown for the West Coast project differ, though not to a large degree, from those previously announced. The changes are the result of recommendations made in the Environmental Impact Report and of other submissions. The changes are towards larger reservations of lowland biological and amenity areas and will allow an increased area to be managed as beech forests.

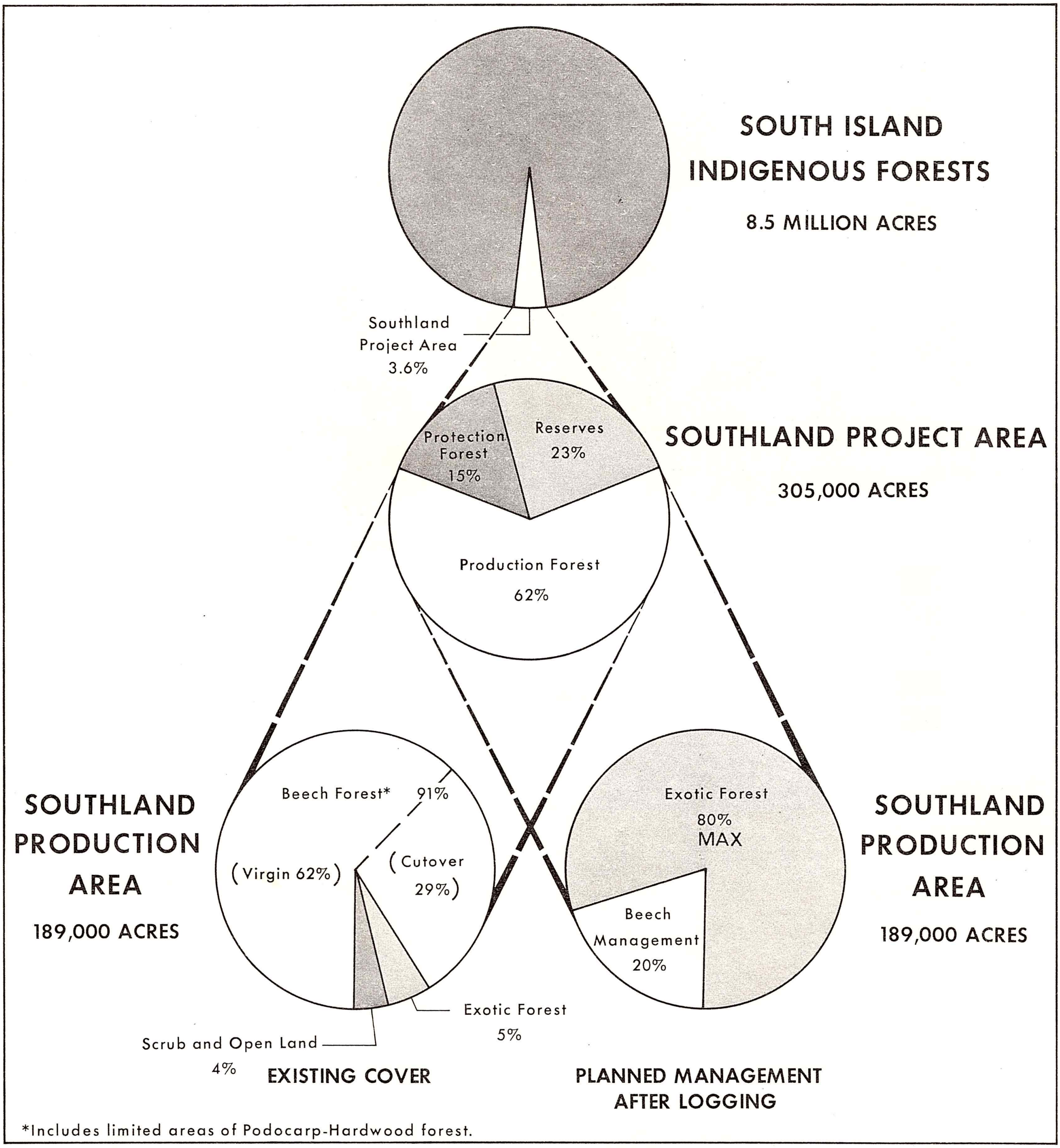


FOREST CLASSIFICATION, SOUTHLAND PROJECT AREA



New Zealand Forest Service 1973

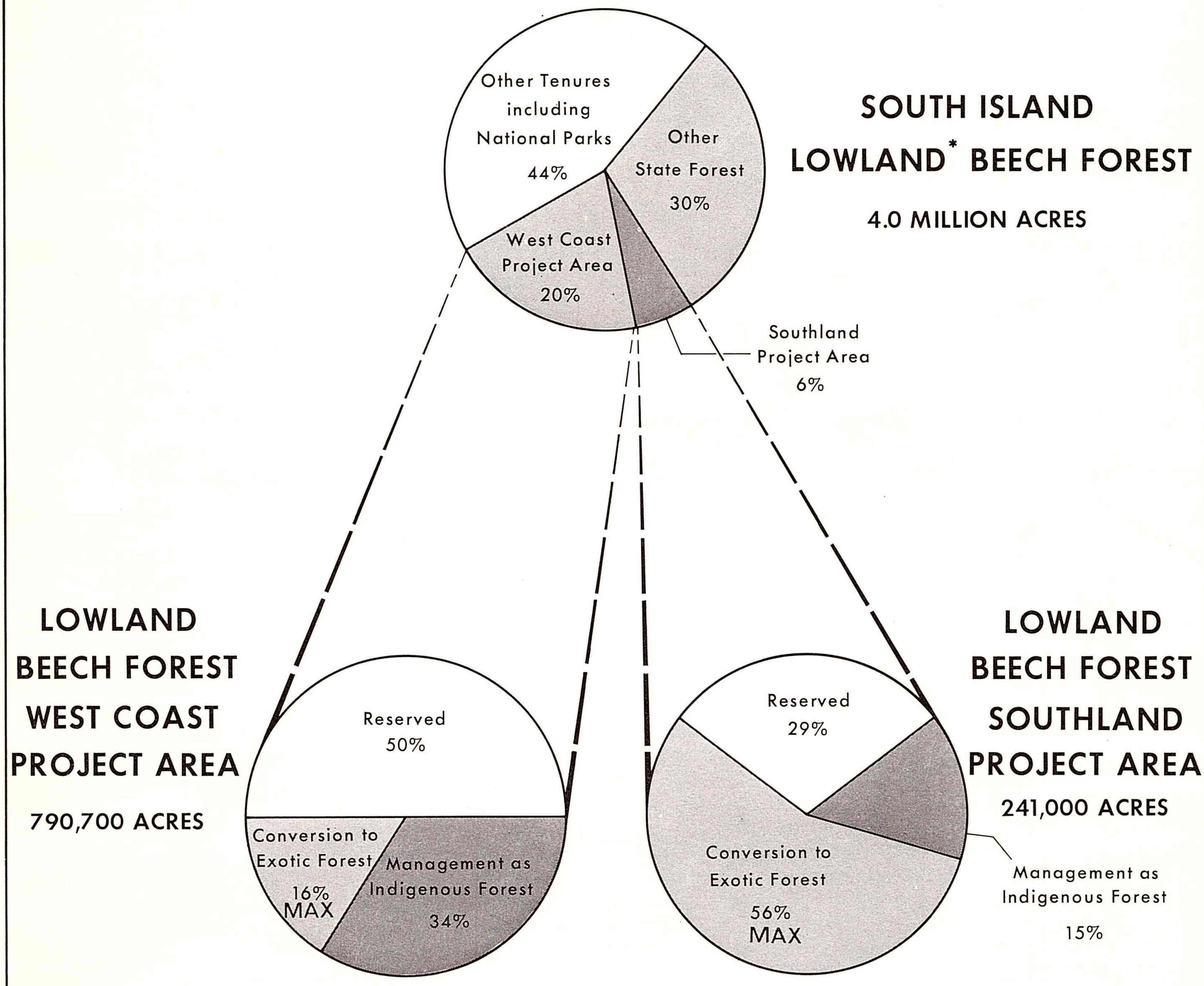
AREA BREAKDOWN
SOUTHLAND BEECH PROJECT AREA



*Includes limited areas of Podocarp-Hardwood forest.

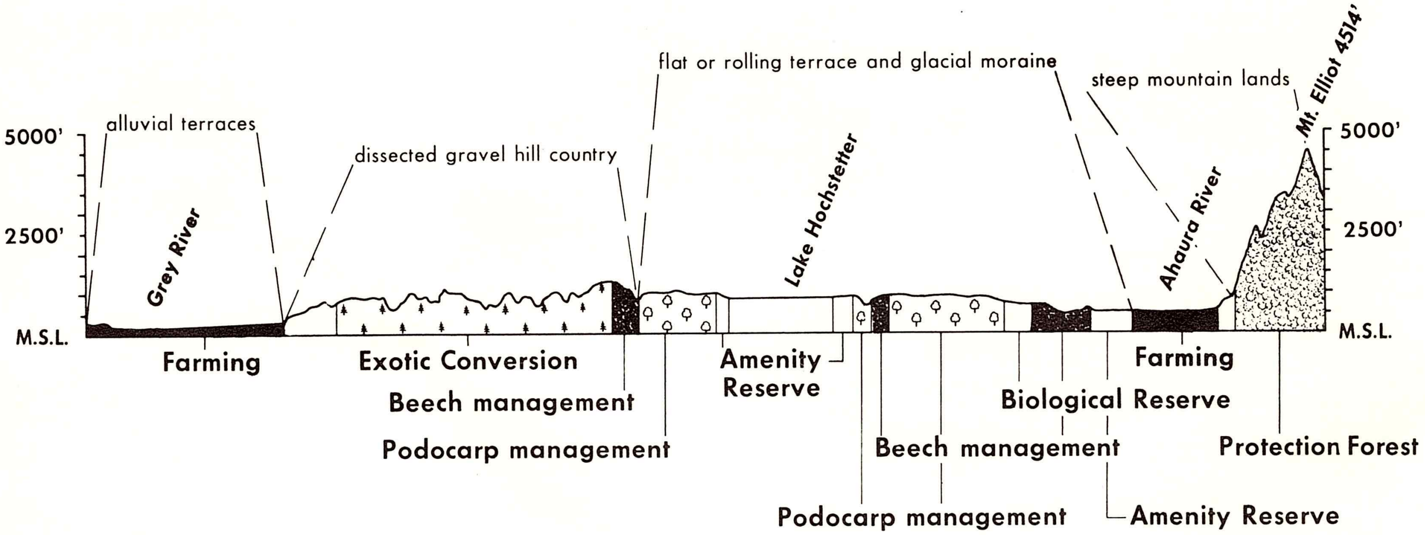
AREA BREAKDOWN

LOWLAND BEECH FORESTS



*Defined as forest below 2000' in Southland Conservancy and 2500' elsewhere in the South Island

WEST COAST CROSS-SECTION



The diagram above is a cross-section through a typical part of the West Coast project area. It extends across Hochstetter State Forest from the Grey River to the Elliott Range.

It is proposed to convert to exotic plantations the forests on the relatively well drained "Blackball" soils of the gravel hill country which borders the Grey Valley farmland. This work has been under way in Hochstetter Forest for several years.

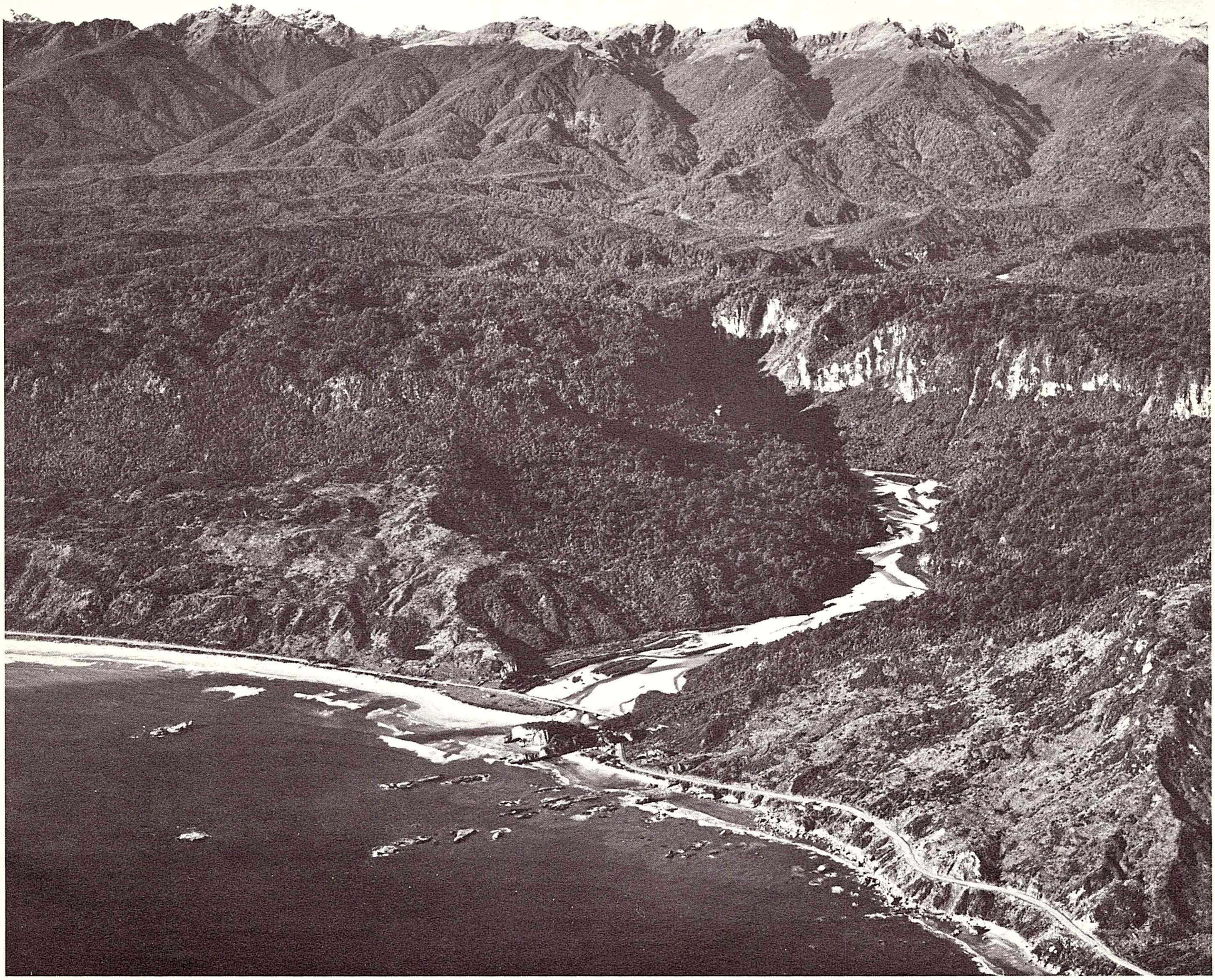
On the wet and infertile "Okarito" soils of the terraces to the east, the rimu forests will be perpetuated by selection logging. These terraces have been formed by the outwash from large glaciers. The forests of rolling country still further east (on "Waiuta" soils, most of which are formed from ice-borne rock and sand known as moraine and deposited when the glaciers finally melted and retreated) will be managed as beech forests.

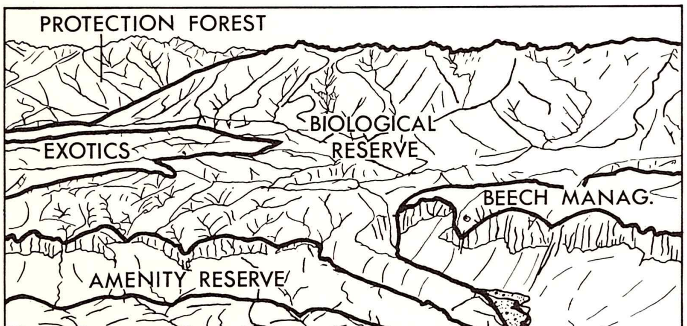
The forests around Lake Hochstetter have been reserved for scenic and recreational purposes and a variety of forest types has been zoned for preservation in the Flagstaff Creek biological reserve.

Finally the easternmost mountain flanks have been reserved as protection forest.

The cross-section broadly illustrates not only the relationship between the geology, soils, and proposed forest management but the gradient in land use intensity, which is a feature of the West Coast proposals. Bordering the intensively farmed alluvial soils of the Grey Valley is a zone of equally intensively managed plantation. This is paralleled by a less intensively managed zone of native forest, which in turn is bordered by protection forest of the mountain ranges, "managed" only extensively by the control of noxious animals.

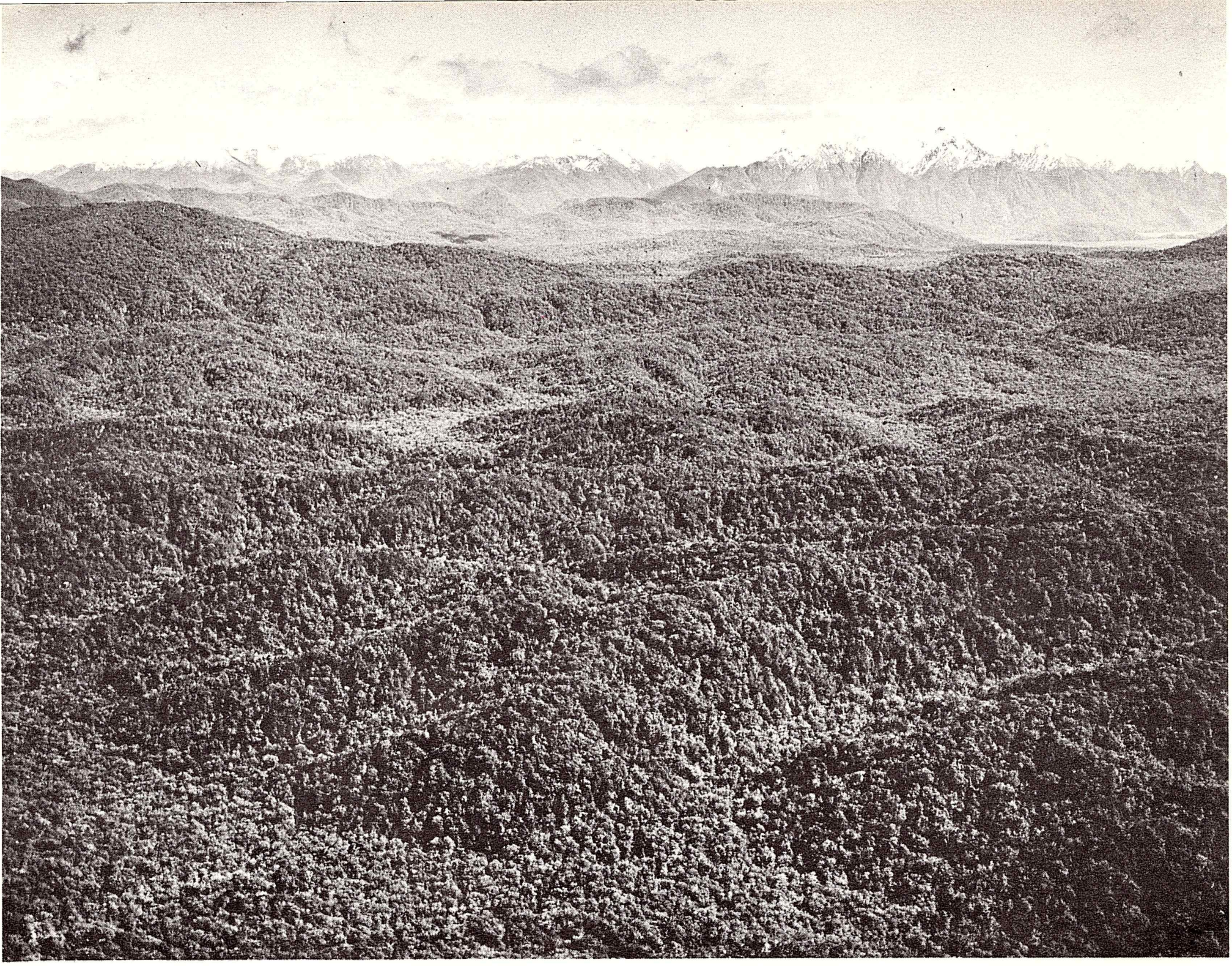
Each of these zones has its own interests and attractions and in recreational and aesthetic values they would be complementary to each other.

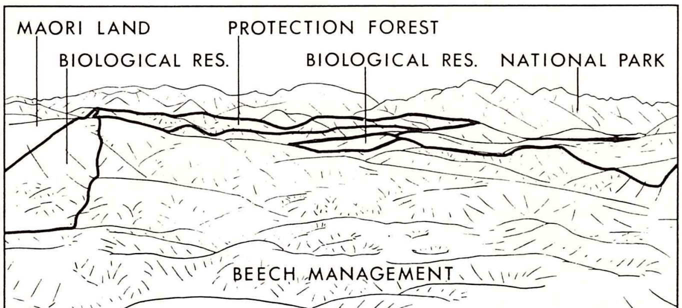




WEST COAST ZONING EXAMPLE

The principles used in classifying the forests for future use are illustrated in the above aerial oblique photograph of part of the Charleston region of the West Coast project area. The forest on the coastal cliffs is reserved for amenity (scenic) purposes. Behind, a major biological reserve preserves a continuous range of forest types from the coastal forests on pock-marked limestones to the sub-alpine silver beech scrub high in the Paparoa Range. The flanks of the whole range are reserved as protection forest. In the left background on dissected hill country, carrying hard beech, conversion to exotics is planned. On the far right beech management would be practised on rolling hill and terrace land. The prominent stream is the Fox River.





SOUTHLAND ZONING EXAMPLE

The zoning principles are shown again in this aerial photograph, looking from Rowallan State Forest, Southland, towards Fiordland National Park over rolling lowland clothed with silver beech forests. It was the study of these forests by J.T. Holloway during the National Forest Survey of the late 1940s to early 1950s that led to the theory that past climatic change could explain many of the anomalies in the distribution of forest types in New Zealand. The two biological reserves shown will preserve forests of importance to this hypothesis and are thus of considerable scientific interest. The zoning of remaining forest in the photograph is largely self-explanatory.

CONVERSION TO EXOTICS

The prime motivation for the beech forest proposals is the desire to develop an economically and environmentally sound use for the waste of the forests logged for beech and podocarp sawlogs. Although the nature of a viable industry has not been prejudged and would be determined in the second stage of inviting specific proposals for use, economies of scale are important in the use of relatively low value chip wood. It is likely therefore that a large plant such as a sawmill-pulpmill complex would be needed on the West Coast. If so, continuing supplies for it could not be sustained by the regeneration of beech forest alone. The solution to the problem of maintaining supplies to a major integrated industry lies in converting part of the logged over forest to much faster growing exotic plantation, mainly of radiata pine. This remarkable Californian tree is the basis of New Zealand's vigorous forest products industries. The forests to be converted should be, and would be, those least suitable for regeneration as beech or podocarp forests.

The proportion of the logged over forest which would be converted to plantations depends on two considerations:

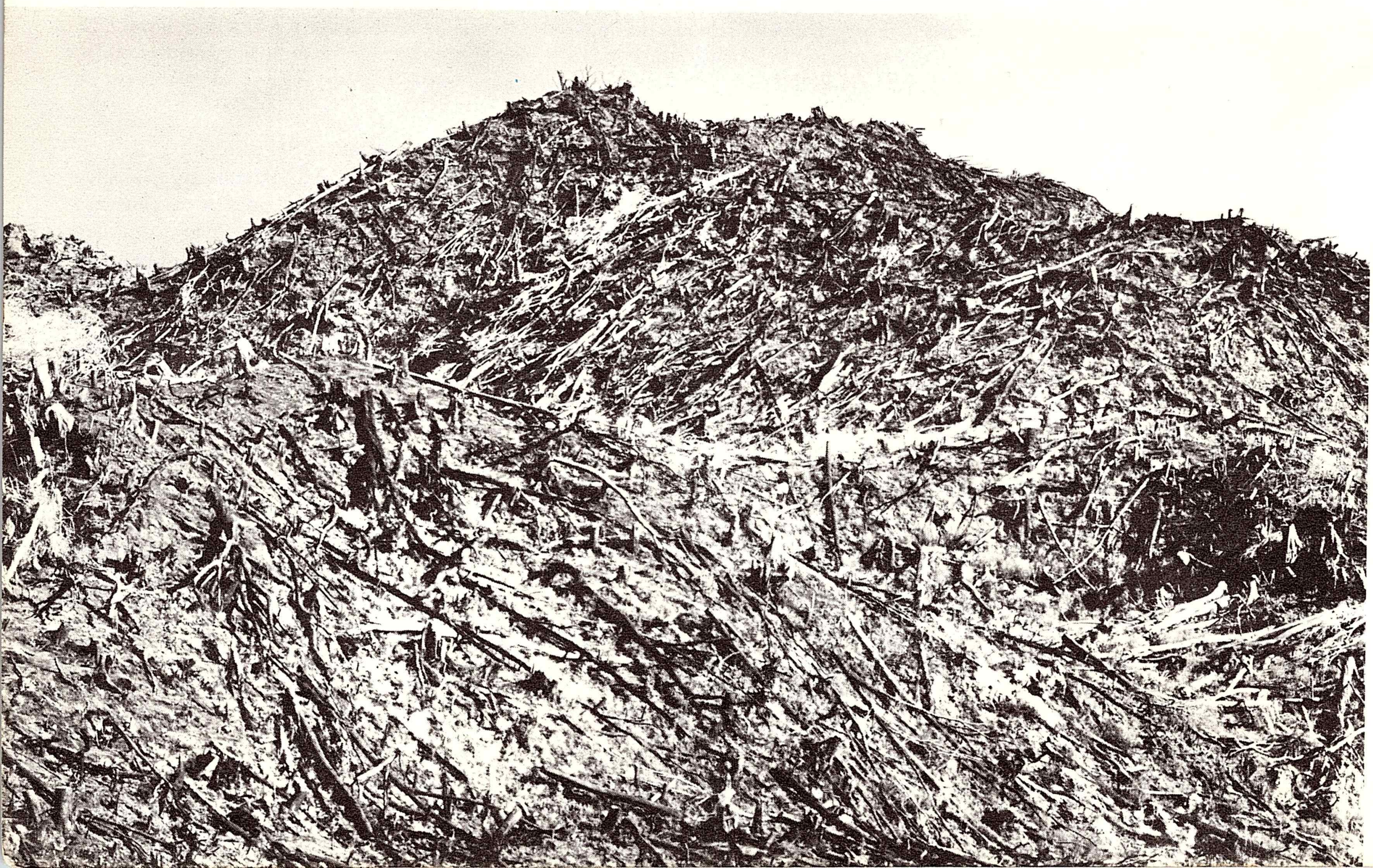
- An appropriate balance of land use between highly productive plantations and regenerated beech forests of considerably lower productivity but with other, less tangible values.
- The type and scale of industry best suited to use of waste wood, and the area of exotic plantations needed to ensure continuing supplies of wood to this industry.

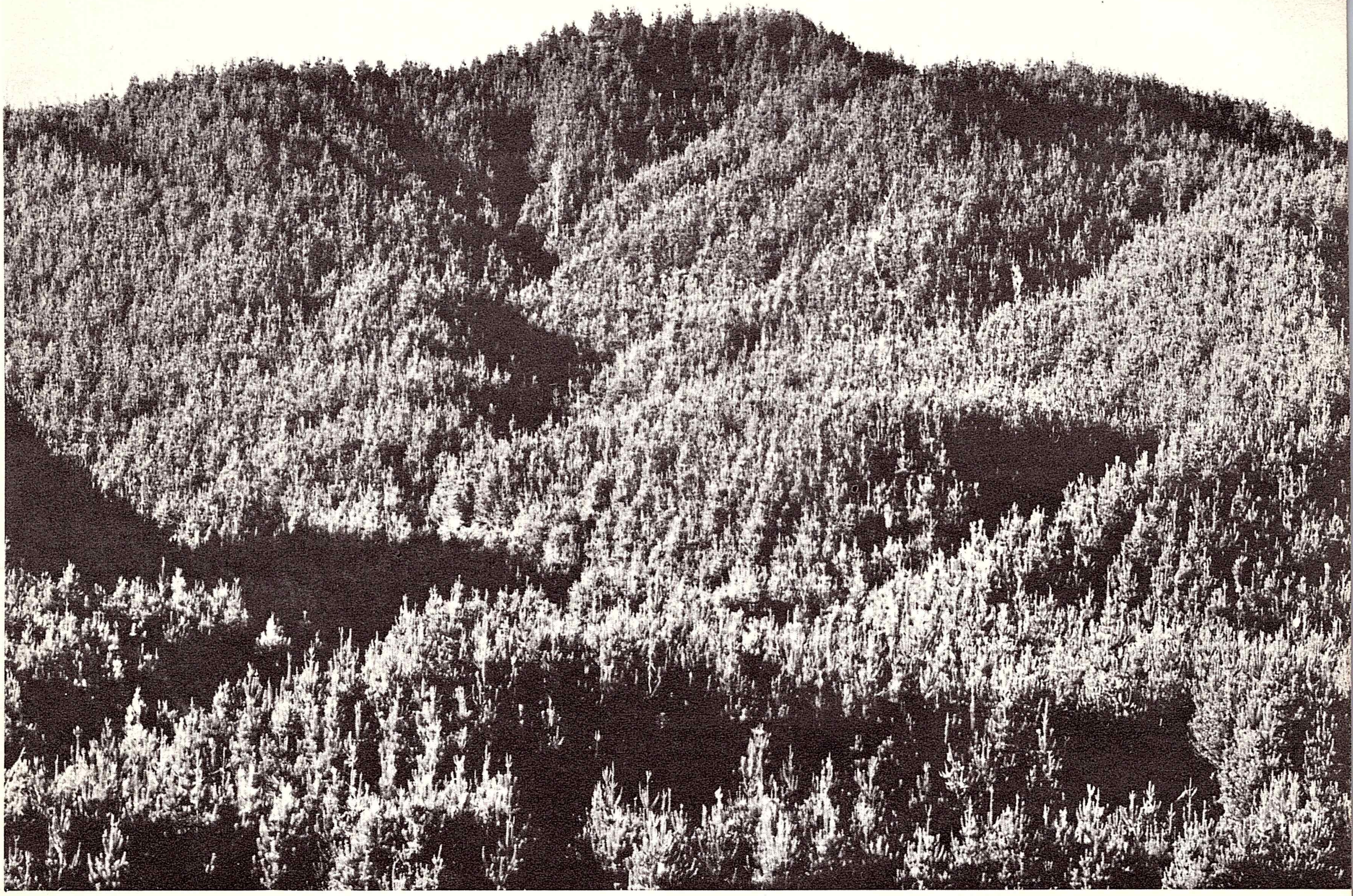
In the West Coast project area, and to a lesser extent in Southland, hill country, podocarp — hardwood forest is ecologically unsuitable for regenerating to podocarps and after logging is reduced to a crop of low-value hardwoods. Generally the best land use for many such areas is conversion to plantations. The process has been under way in cut-over forests in both project areas for some years now. In the West Coast project area 83,000 acres of podocarp — hardwood hill forests are zoned for eventual conversion to exotics.

The remaining areas scheduled for possible conversion are mainly hill country beech forests dominated by relatively low-value mountain and hard beeches or by other species in situations where obtaining adequate regeneration would present considerable practical difficulties. Provided adequate reserves are maintained and substantial areas of better quality beech forest are regenerated, and managed, conversion of lower quality forests is the most justifiable form of land use and one that will add greatly to the value of the forest estate as a whole, without sacrifice of regional native forest values.

The areas shown as potential exotic forests in the previous section — 241,000 acres on the West Coast and 152,000 acres in Southland — are gross areas and are maxima. Within them native forests will be maintained along the streams, and belts of intact forest will be left as havens for wildlife. The resultant "gallery" of native forests must be deducted from the gross area to obtain the net plantable area for exotics. At least 30,000 acres is likely to be required for these purposes on the West Coast. The area finally zoned for conversion would be decided when the scale of any new industry was decided and would lie within that area zoned for conversion in the broad proposals currently under consideration.

It is important to appreciate that the exotic forest is planned to be large enough to provide for the long-term wood needs of any industry that might eventuate. No further reliance would then need to be placed on beech forests, and pressure to log additional areas of beech would be forestalled. The regenerated beech forests could be used either for wood or for recreation, as wildlife habitat or for other purposes, in any combination which future generations might deem desirable. It is to be hoped that all of these values will be realised but the choice would not be predetermined.





THE CONVERSION SEQUENCE

Conversion of cut-over podocarp-hardwood hill country forests to plantations has been under way on some scale in Westland since the early 1960s. To date about 18,000 acres have been planted and the present programme in State forests is 2,500 acres annually. The plantations are being established to support the sawmilling industry after the eventual exhaustion of podocarps in North Westland.

The upper illustration opposite shows the residual cover of native hardwoods, mainly kamahi, quintinia, and southern rata. This is felled on a face as soon as possible after logging, using light-weight one-man power saws. The work is arduous and requires considerable skill.

After seasoning for some months the felled hardwoods are burnt in summer. This is also a skilled operation. A hot burn is needed to reduce the amount of woody material on the ground and prevent subsequent competition from hardwood regrowth. The burnt area is ready for planting in the following winter. The lower illustration opposite shows a recently burnt and planted area in Mawhera State Forest. Despite the hot burn a layer of organic duff protects the soil beneath from significant erosion.

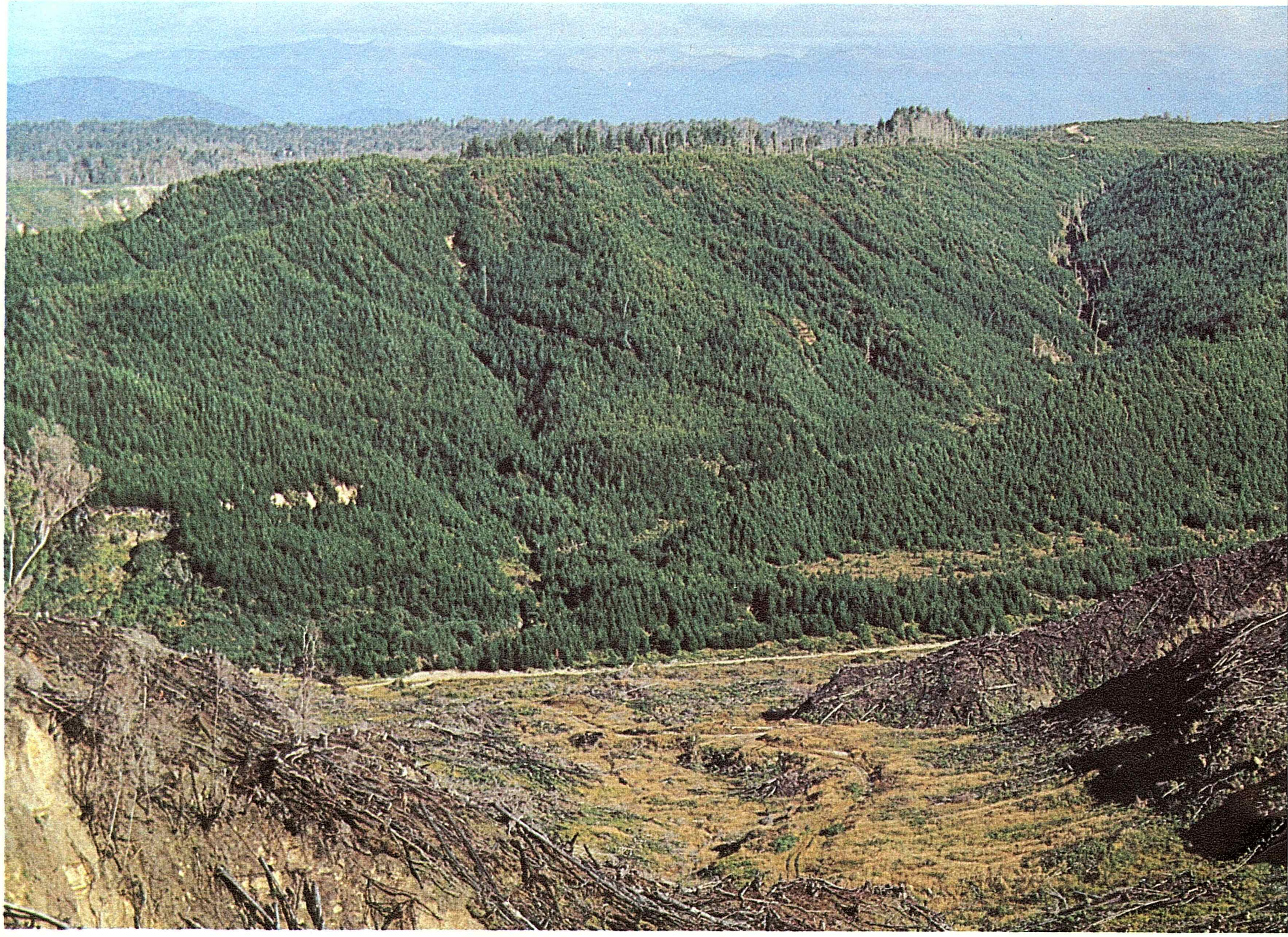
A pulpmill might be able to use the hardwoods now being burnt. If it could, the available resource would be increased and there would be less need for hot burns.

The young plantation grows rapidly and in 6-7 years forms the closed dense canopy shown in the illustration above, also in Mawhera State Forest. At this stage intensive tending — taking out the poorer trees and pruning the better ones — begins. In 25-30 years a crop of sawlogs and pulpwood can be produced having a volume per acre two to four times greater than that of the original forest.

Upper left: A belt of kamahi, quintinia and rata left standing as a green belt. Similar cut-over forest has been felled to make way for fast growing exotic trees.

Lower left: Burnt and recently planted hardwood cut-over.

Above: A similar cut-over 6-7 years after planting.

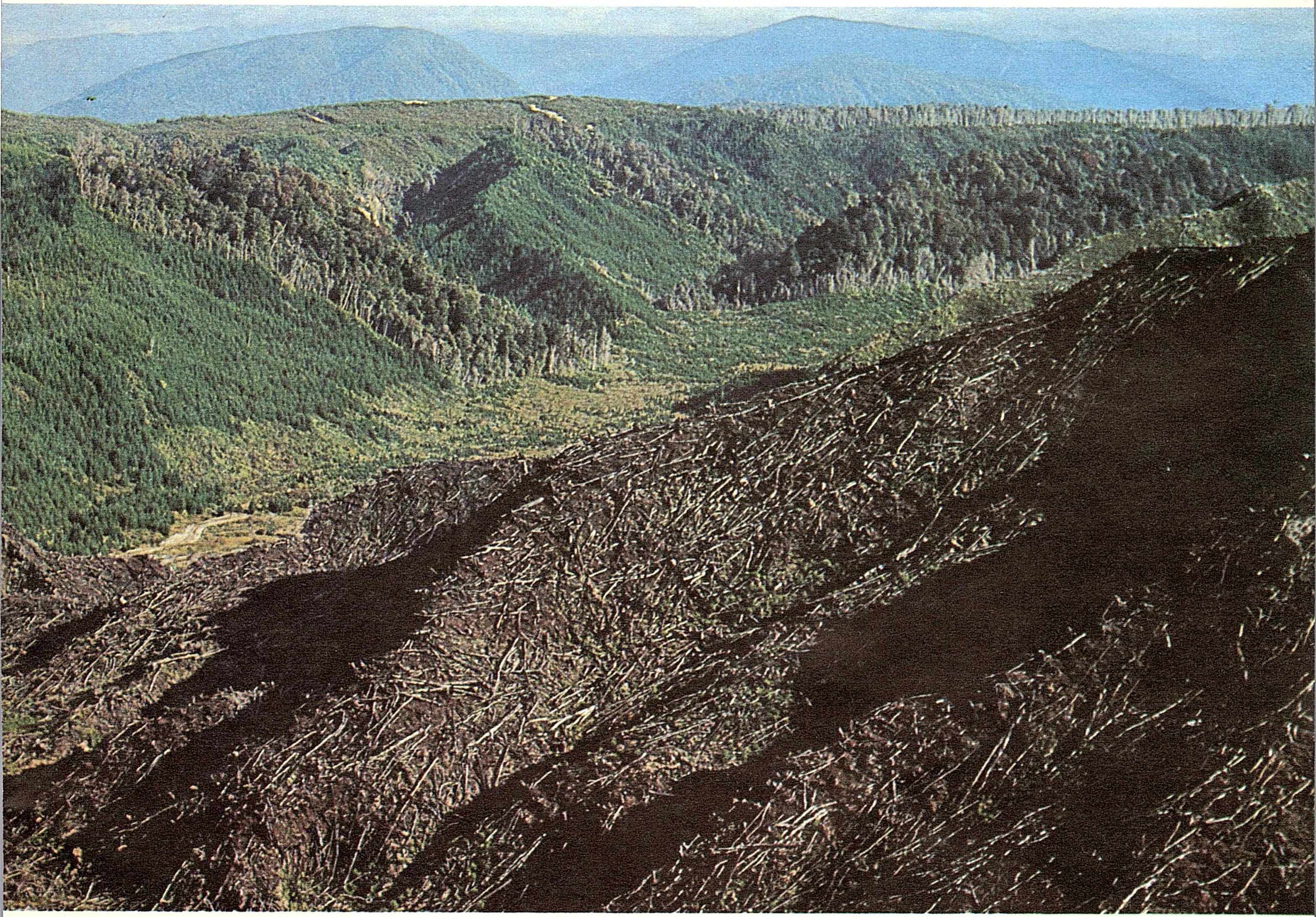


PANORAMA OF

Like the legendary Phoenix a new production forest arises from ashes in Mawhera State Forest, North Westland. What has been lost in providing this growing asset? The cut-over podocarp — hardwood forests have no value for continuing wood production. Their use for recreation, other than by local hunters, is at present negligible and is never likely to be great. They have no particular scenic beauty though they do provide a good habitat for many birds. However, it is important to realise that some of the native wildlife they contain will be sustained by spread from surrounding forests and havens deliberately left in clearing operations. Although plantations clearly cannot provide the same recreational and wildlife values as native forests they are far from valueless in both respects. Exotic State forest such as Whakarewarewa in the North Island and Hanmer in the South Island have become extremely popular recreational areas, and well tended plantations particularly those with residual blocks of native forest support surprisingly large and diverse populations of native birds.

The loss of some values in conversion must be balanced against the considerable gain in others and against the large area of reserved or regenerated native forests which will always remain. The fears that conversion will make massive inroads into the remaining native forest are unfounded both regionally and nationally.

Though this is the fundamental source of doubt, conversion, particularly on the West Coast, has been challenged on the basis



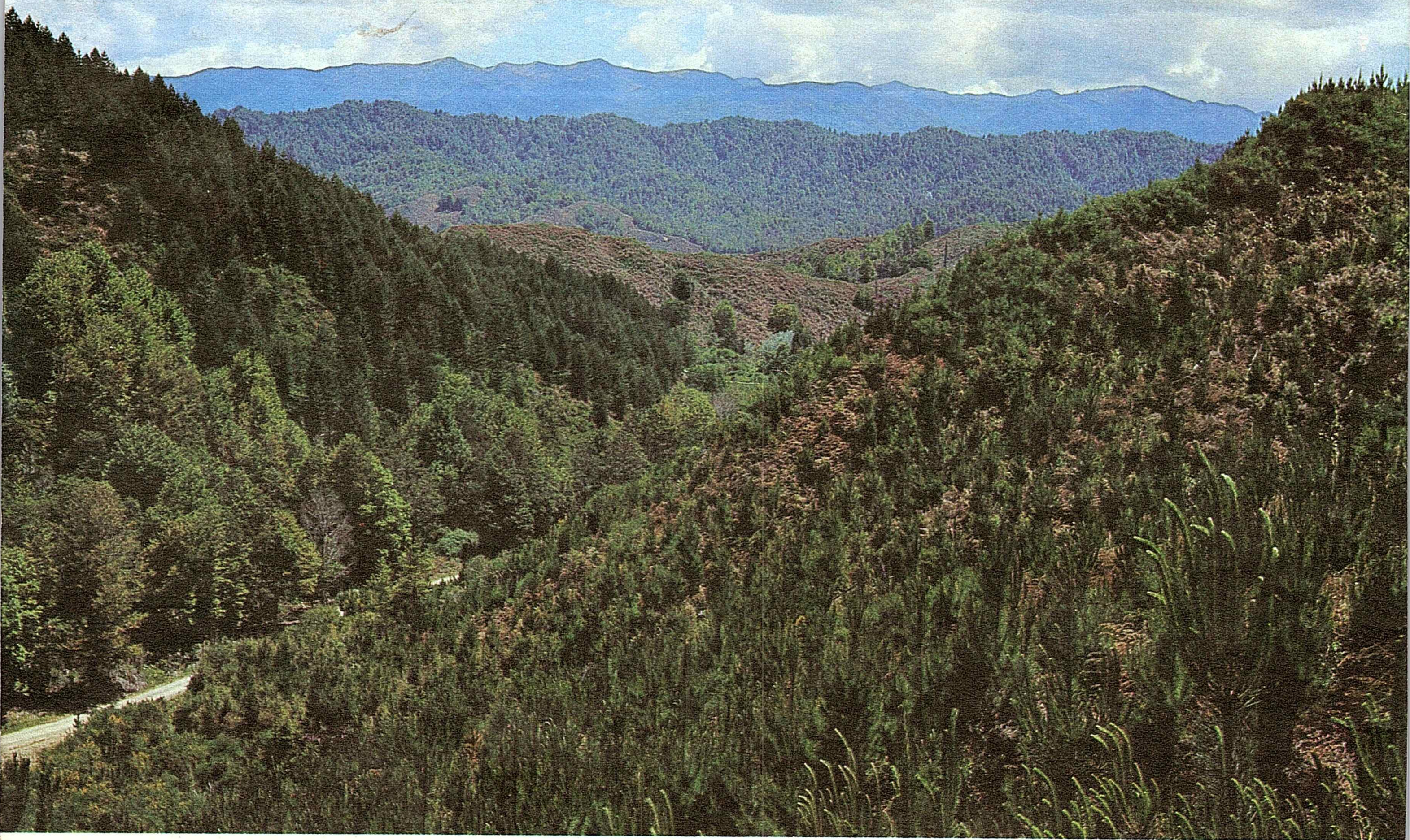
The above panorama of Wallaby Creek in Mawhera State Forest shows an area which less than a decade ago was cut-over hardwood forest. The unattractive appearance of the burnt and recently planted area in the foreground soon gives way to the not unpleasing appearance of the plantations beyond.

A NEW FOREST

of supposed soil degradation under exotic trees, massive erosion, and extraordinary risk of fungal and insect attack to plantations. Such criticisms must be examined in perspective.

There is no evidence that exotic forests degrade soils to a greater degree than do native forests Radiata pine on hill soils of the West Coast has grown rapidly and the oldest plantings are now approaching maturity. Chemical analyses indicate that topdressing with fertilisers will probably be required in the second and later crops to maintain productivity. This is normal practice in farming the soils of the region and of New Zealand generally. The possible use of fertilizers and sprays has been a source of criticism from those who oppose conversion, but such management practices are again common to all forms of intensive cropping and the quantities required per acre in forest growing are very small in comparison with those used in maintaining our pastures.

The area to be converted to exotics in any one catchment at any time would be restricted by spreading logging operations in a "patch cutting" pattern. This would minimise the effects of any additional water run-off, which would in any case be temporary. No major problem of erosion has been encountered in the conversion to exotics of the 18,000 acres of existing forest on the West Coast but care is required. In this respect the results of soil surveys will be important.



Streamside beech forests.

"NON-PRODUCTIVE" VALUES OF PLANTATIONS

Although the prime purpose of plantations is wood production, they offer a creative challenge to foresters to landscape them for other values. This challenge has spurred interest and increased activity throughout New Zealand. Well tended pine plantations are a source of interest in themselves and are aesthetically far superior to the massive untended plantings of past years. By growing a variety of colourful introduced trees in strategic locations this aesthetic appeal can be greatly enhanced as shown by the mixed plantings of exotic hardwoods and conifers in Hanmer State Forest (lower illustration opposite). Only small areas are needed to provide visual relief.

Where plantations are being formed by conversion of native forests aesthetic appeal can be enhanced by preserving some of the original forest, as demonstrated in the upper illustration opposite of mixed native beech and exotic pines in Tawhai State Forest, West Coast project area. This is typical of what might be expected in future conversion.

Strips of beech beside streams (such as that shown above) would also be preserved in conversion areas, not only for aesthetic appeal but for conservation of soil, water, and fisheries values.

Lower opposite: Mixed exotic hardwoods and conifers in Hanmer State Forest, Canterbury.

Upper opposite: Mixed beech and pines in Tawhai State Forest near Reefton.

SOCIAL CONSIDERATIONS

From the foregoing description it will be appreciated that the beech forest proposals far from being exploitive and destructive are designed to lead to a more mature approach to the use of our native forests. This basic fact has eluded many of the critics, but was appreciated by the Environmental Council, which commented as follows in its report on the proposed utilisation of the South Island (West Coast) beech forests:

> "The proposals are not an attack upon a virgin resource, but are in fact the continuation of more than a century of timber exploitation. Perhaps the title to the White Paper* has had an undesired result as it implies that the forests are not being utilised. What are novel are the scale and comprehensiveness of the project. For those reasons, if it is undertaken, it should be so planned as to mark the close of the first century of bush felling without the control of environmental standards, and to mark the opening of a new era of integrated planning to ensure wise long-term use of the forest resources.
>
> "Present methods of logging beech-podocarp associations are environmentally most unsatisfactory. An intolerably high proportion of the wood resource is being wasted (up to 75%). Proposals for the clear-felling of some of those areas, utilising the residual wood, regeneration for beech forest management and exotic plantings in selected areas should be accepted as an infinitely preferable utilisation of the resource."

As always in creative endeavour many problems will need to be solved as they arise, but past experience in both farming and forest practice in this country give cause for confidence. Comments in the Environmental Impact Report† are pertinent:

> "What must be appreciated is that the Forest Service proposals call for no widespread and sudden change in land use but involve the gradual alteration of part of the forest area from a virgin or partially logged condition to a regenerated second crop and from native to exotic species, on the basis of continuing research and by men trained in the appropriate disciplines. The schemes are complex ones which must be seen in their entirety to be appreciated."

This booklet has dealt largely with the first two aspects of the motivation (page 13): better utilisation and better management. But forests are for people, and in the final analysis the social consequences are the most important aspect. This is particularly so on the West Coast, where employment in the basic industries dropped by 1,800 between 1956 and 1971 and where a number of increasingly under-utilised services are becoming more difficult and expensive to maintain. Mining of coal or ilmenite might partially arrest the out-migration of young people and the social problems of a declining economy, but only better use of land-based renewable resources offers a permanent solution. The 300 jobs now available for bushmen and mill workers within the West Coast project area could be doubled or even quintupled by better utilisation — depending on the scale of the industry needed to solve the problem. More important, the jobs would be permanent because the forest could be managed as a renewable resource. The better management of the forests would itself create further opportunities for skilled work.

It has been suggested that tourism and sea fishing offer alternative means of increasing West Coast employment. However, though further development of both would be generally welcomed, neither industry is likely to employ large numbers. Good fisheries management, incidentally, has many analogies with good forest management in that both depend on careful conservation of natural resources by regulation and harvesting of the increment. No feature of the beech forest proposals precludes the further development of tourism. In fact the maintenance of essential services can only help that industry.

It has also been suggested that the "timber towns" associated with a major West Coast project could have undesirable social consequences. The West Coast project area is geographically widespread and logging would thus be dispersed. It would draw on existing townships with a tradition of logging and sawmilling. A large mill would doubtless also utilise the services of an existing community, in which case social disruption would be minimal.

If the West Coast sawmilling industries merely carry on as at present, the useable native forest resources, mainly of podocarps, will be exhausted in the project area in not much more than 30 years.

The area worked over will be almost as extensive as that zoned for production in the Forest Service proposals, but it will be left in a largely unmanaged condition — with the exception of plantations grown on cut-over hardwood hill country. The planted forests are however unlikely to mature in time to prevent the close down of much of the present industry. This rather gloomy picture also applies in some degree to western Southland, but with less critical social consequences.

The choice then is not simply between preservation and use of the beech forests, but between the present essentially exploitive use and conservation, in the sense of wise management. Without improved utilisation there is no possibility of better forest management and thus no choice.

Those forest values which depend on preservation will be protected irrespective of whether the beech forest proposals proceed further, and areas such as that shown on the opposite page will always be a feature of the New Zealand landscape.

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*"*Utilisation of South Island Beech Forests*", *Wellington, Government Printer, 1971.*

†*N.Z. Officials Committee for the Environment working party. "Environmental Impact Report on the Proposed Utilisation of South Island Beech Forests". Wellington, 1973.*

Beech forest in Rimutaka State Forest Park, near Wellington, acquired by the Forest Service for public recreation.

FURTHER ACTION

In the report to the House of Representatives of October 1971 it was stated that proposals for the utilisation of Southland and West Coast beech forests would be invited from industry — after allowing adequate time for public consideration and representations, and subject to Government approval. It was further stated that the closing date would give interested parties sufficient time to make thorough feasibility studies and that proposals would be subjected to most careful scrutiny, not only in respect to their desirability on economic or social grounds, but also having regard to the possible environmental consequences of the industries themselves.

The first stage in Forest Service planning — public consideration of the broad scheme — has taken longer than expected, a reflection of the nation wide interest, and of the depth of the environmental examination. Official reports have been written by the Nature Conservation Council, the Officials Committee for the Environment, the Environmental Council and a special committee of the National Development Council. Each of these bodies has visited the areas concerned and the last three have studied many reports from government departments in reaching the conclusion that, subject to a number of qualifications and recommendations, the West Coast proposals could proceed to the next stage.

The National Development Council recommended deferring the Southland project to allow time for further investigations. The Nature Conservation Council on the other hand, considered that the Southland project should proceed in a modified form but the West Coast project needed further investigation.

In addition to these reports there has been a large volume of correspondence between the public, the Forest Service, and Ministers, and petitions raised by CoEnCo and the Royal Forest and Bird Protection Society have been heard and reported on to the House.

In deciding whether to proceed, and in defining the conditions under which any approval might be given, Government will have had the opportunity to draw on a wide variety of comment from numerous sources.

Thus a decision to proceed would be qualified by many of the safeguards suggested by environmental bodies and by the Forest Service itself during the lengthy discussions on the projects. In particular further study of flora and fauna, soils, and management practices would be guided by a Scientific Co-ordinating Committee comprising representatives of government departments and independent scientists. Government would be advised on all aspects of management, utilisation and the environment by a South Island Beech Forests Management and Utilisation Council comprising representatives of Regional Development Councils, ecological, conservation and wildlife interests, industry and the Forest Service, as described in its manifesto statement on forestry.

There has been some criticism of the staged approach taken by the Forest Service, and endorsed by the Government. Critics have pointed to the lack of comprehensive economic analyses of possible alternative developments. However, before the feasible range of alternatives in any development of natural resources can be decided, the environmental constraints must be clear. This is the intent of stage one. The thorough economic analysis of alternatives has been planned from the outset as part of the second stage — the detailed scrutiny of real industrial proposals. Little purpose would be served, and a great deal of effort would be wasted by attempting economic or benefit/cost studies in vacuo. In entering stage two no commitment would be given by Government or implied. The submission and analysis of industrial proposals, without commitment, is a standard and well tested practice in securing the best available use of State owned wood resources by way of long term sales. It is one that has commonly led to the successful development of new markets using technology previously untested in New Zealand and it allows the fullest possible expression of industrial expertise and ideas. The criteria used to select the successful proposal would not be narrowly confined to profitability but would include an assessment of the general benefits to the region and nation.

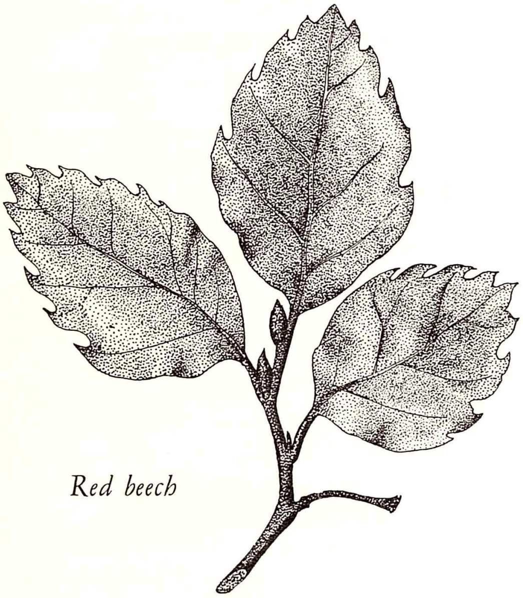
The most important aspect of this procedure is the complete flexibility which it allows. Rather than being directed at a single development, or a narrow range of alternatives, the invitation of proposals for the use of all or part of a specified volume and quality of wood allows the submission of any development conceived as practical and profitable by industry.

If proposals are invited it would probably take eighteen months to two years to receive and analyse any that might be put forward and then to select the best. No final decision will have been made on the utilisation of South Island beech forests until this has been done.

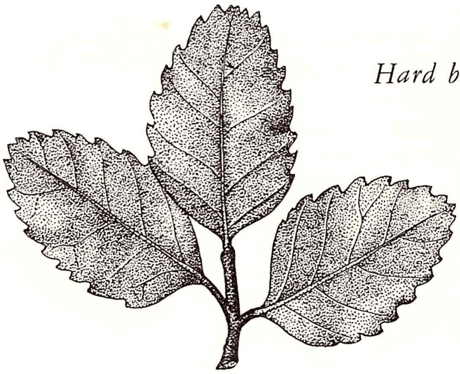
Finally the Forest Service view of its proposals has not changed from that expressed in the report to the House of Representatives:

> "The economic well-being of New Zealand and the preservation of its unique natural features both depend on wise use of the land. Neither may be accorded a higher priority than the other as of right, nor is there any simple means of arriving at the optimum balance between development and growth on the one hand and preservation of natural resources on the other. Where there is a major conflict the choice between economic welfare and what is commonly referred to as 'the quality of life' is one for informed public decision. In the case of South Island beech forests there should be no such major conflict, since the areas involved are large enough to accommodate both interests. The Forest Service believes that, provided the necessary safeguards are adopted, economic growth and the maintenance of environmental values are here compatible."

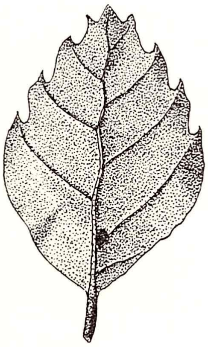
BEECH FOLIAGE

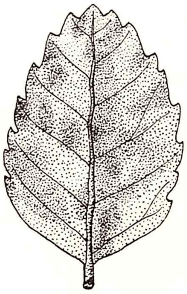


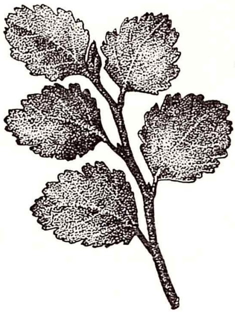
Red beech



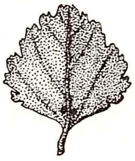
Hard beech

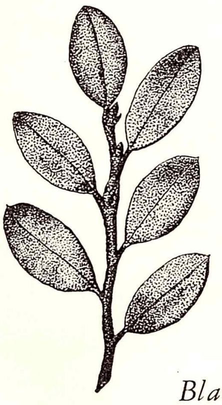




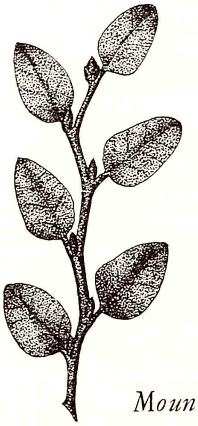


Silver beech

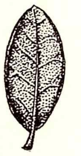


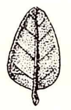


Black beech



Mountain beech





Leaves Natural Size

A. Cunningham Delt.

APPENDIX 1 — BREAKDOWN OF PRODUCTION AREAS

(All figures provisional)

	WEST COAST	SOUTHLAND
MAXIMUM PRODUCTION FOREST AREA	acres	acres
Existing exotic forest	13,000	10,000
Scrub or open land to be planted to exotics	17,000	6,000
Forest, scrub, and open land allocated to farming	15,000	—
	45,000 (8%)	16,000 (8%)
Podocarp-hardwood forests, semi-pakihi forest, and scrub to be managed as indigenous forest	86,000[1]	—
Beech forest and scrub areas[2] to be managed predominantly as beech forests	255,000	
Total area to be managed as indigenous forest	341,000 (57%)	37,000 (20%)
Podocarp-hardwood forest, some already logged, for conversion to exotic forest	83,000	—
Beech forest, some already logged, for conversion to exotic forest	128,000	136,000
	211,000 (35%)	136,000 (72%)
Total	597,000 (100%)	189,000 (100%)
MAXIMUM BEECH FOREST AREA		
Maximum area of beech forest scheduled for possible utilisation, including cutover	398,000	172,000
Maximum area as percentage of:		
All lowland beech in State forests in project area	50%	71%
All lowland beech forest in Nelson and Westland Conservancies	17%	—
All lowland beech forest in Southland Conservancy	—	12%
All lowland beech forest in the South Island	10%	4%
All South Island indigenous forests	5%	2%
MAXIMUM CONVERSION AREA	acres	acres
Area of virgin beech forest and cut-over beech forest in the project area zoned for possible conversion to exotics	128,000[3]	136,000[4]
Area for conversion as percentage of:		
Beech forest to be utilised in the project area	32%	79%
All lowland beech in State forests in project area	16%	56%
All lowland beech forests in Nelson and Westland Conservancies	5%	—
All lowland beech forests in Southland Conservancy	—	10%
All lowland beech forests in the South Island	3%	3%
All South Island indigenous forests	1.5%	1.6%

[1] Includes some beech forest to be managed primarily for podocarps.
[2] Beech 244,000 acres, scrub areas 11,000 acres.
[3] Virgin beech 102,000 acres, cut-over beech 26,000 acres.
[4] Virgin beech 92,000 acres, cut-over beech 44,000 acres.

NOTE: "Beech forest" in the Southland project area includes limited areas of podocarp-hardwood forest types.

Back Cover: The mountain beech in flower.